AN EPISODE APPROACH TO UTILIZATION, COSTS, & EFFECTIVENESS IN HEALTH CARE

HCFA Grant #18-P-97235/9-02

Final Report
Volume 3

8/16/83

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Final Report

VOLUME 3

Jane Cassels Record

Thomas M. Vogt

Rhesa Lee Penn

Richard E. Johnson

Health Services Research Center
Kaiser Foundation Research Institute
4610 S.E. Belmont Street
Portland, Oregon 97215

November 30, 1981

TABLE OF CONTENTS

VOLUME 1

I. Introduction - Origin and Purpose of the Study 1

II. The Setting of the Project 7

III. Research Design 17

IV. Assets and Limitations of the Data 60

V. Obesity - R. Johnson 70

VI. Acute Cystitis - T. Vogt 142

VII. Essential Hypertension - R.L. Penn 204

VOLUME 2

VIII. Hemorrhoids - R.L. Penn 325

IX. Otitis Media - R. Johnson 410

X. Fever of Unknown Origin - R. Johnson 454

XI. Depression - M. McCally, R.L. Penn 502

VOLUME 3

XII. Gonorrhea - R. Worthington 569

XIII. Headache - R.L. Penn 609

XIV. Breast Lump - J. Mullooly 684

XV. Shoulder Bursitis - R.L. Penn, H. Frankel 744

XVI. Summary and Conclusions 810

Glossary of Terms 838

VOLUME 4

Appendices

SECTION XII. GONORRHEA

Richard Worthington, M.D.

ABSTRACT

Episodes of gonorrhea consisted of all contacts for care where gonorrhea was a confirmed diagnosis at the contact. Gonorrhea was classified as a chronic disease so that a person could have one or more episodes of gonorrhea. Episodes of gonorrhea included all contacts within a 90-day period unless information indicated that either a new episode had begun within the period or that the same episode continued beyond 90 days.

There were 206 episodes of gonorrhea, with duration ranging from one to 191 days. Almost 40 percent of episodes were one contact for care episodes, although all but three episodes had resource costs charged to them.

Seven different treatment bundles were identified among episodes lasting two weeks or less. There was a three-fold difference in the mean costs per episode between the lowest cost treatment bundle and the highest cost treatment bundle. Three utilization measures, the number of physician contacts, the number of laboratory tests, and the number of registered nurse contacts, were the major predictors of costs of episodes of gonorrhea and accounted for 59 percent of the variation in episode costs. It also appeared that drug costs would be a significant influence upon episode costs, although drug costs were not available. Patient, provider, and medical care

process characteristics did not appear to be substantial influences upon the costs of gonorrhea episodes.

An episode approach to gonorrhea indicated substantial differences in episode costs and in treatment patterns, although gonorrhea is recognized to have a standard treatment protocol. A variety of explanations can be proposed including interphysician variation in the treatment of gonorrhea.

METHODOLOGY

Disease and Episode Definition

This report examines episodes of gonorrhea. Gonorrhea is an acute, infectious disease caused by Neisseria gonorrhorae, a bacterial organism which is most commonly transmitted during sexual activity. It is the most frequently reported communicable disease in the United States. The diagnosis and treatment of gonorrhea are well established and straightforward.

Gonorrhea for purposes of this report was identified by the ICDA, 7th edition code 030.0 as acute or unspecified gonorrhea. Episodes of gonorrhea consisted of the medical care contacts where gonorrhea was an updated morbidity, that is, the diagnosis was confirmed.

The episode began with the first contact where gonorrhea was the updated morbidity. Any contact with the medical care system for gonorrhea later than 90 days after the first contact was considered a new episode of gonorrhea. Contacts within the 90-day period were included as continuing contacts for gonorrhea unless information in the medical record indicated that a new episode had begun. The length of an episode was the number of days between the first and the last contact with gonorrhea as the updated morbidity. A person could have more than one episode of gonorrhea.

Using these criteria, there were 206 episodes of gonorrhea identified among a random 5 percent sample of Health Plan members from September 1966 through December 1973.

DESCRIPTIVE ANALYSIS

Episode Description

Utilization - During the Episode

Almost 75 percent of the episodes involved two or more contacts (Table 12-1). The number of contacts per episode ranged from one to 21 and the mean number of contacts per episode was 3.2.

Over 93 percent of episodes involved at least one contact with a physician (Table 12-2). The number of physician contacts per episode ranged from none to 14 and the mean number of physician contacts per episode was 2.3.

Almost 80 percent of episodes had one or more doctor office visits (DOVs) coded to the episode (Table 12-3). About 40 percent of episodes had one or more follow-up DOVs coded to the episode. Only 1.5 percent of episodes included a hospital admission.

Table 12-4 indicates that almost 43 percent of the episodes had one or more telephone or letter contacts during the episode. The mean number of telephone or letter contacts per episode was 0.7, and the largest number of these contacts in any episode was 10.

About 92 percent of the episodes involved laboratory procedures (Table 12-5). The number of laboratory procedures per episode ranged from none to 11 and the mean number of laboratory procedures per episode was 2.4. Table 12-6 shows that three procedures (G-C culture, G-C smear, and blood serology) accounted for over 75 percent of all laboratory procedures.

The most common procedure was a gonococcal culture, which accounted for 45 percent of the laboratory procedures. Very few (1.5 percent) episodes of gonorrhea had a radiology procedure coded to them.

More than three-fourths of the episodes of gonorrhea had one or more orders for drugs (Table 12-7). The number of drug orders per episode ranged from none to nine, and the mean number of drug orders per episode was 1.8. About 77 percent of the episodes with drug orders included an antibiotic, while almost 39 percent had one or more orders for probenecid, which blocks the renal excretion of penicillin. About 42 percent of the episodes had one or more parenteral injections coded to them (Table 12-8). The number of parenteral injections per episode ranged from none to 13 and the mean number was 0.6.

About 44 percent of the episodes had one or more registered nurse (RN) contacts coded to them (Table 12-9). The number of RN contacts per episode ranged from none to 13 and the mean number was 0.7. Since the registered nurse is the provider who administers the parenteral injections, it is not surprising that the numbers assigned to parenteral injections and those assigned to RN contacts correspond very closely.

In summary, more than 93 percent of episodes had DOVs coded to them (Table 12-10). About 92 percent of episodes had laboratory tests and more than 78 percent had drug orders. Almost 43 percent of the episodes had telephone calls coded to them. About 42 percent of the episodes had parenteral injections. Only three episodes involved a hospitalization.

Utilization - At First Contact

Another way of describing utilization is to examine the procedures occurring at the first contact for the episode. Table 12-11 shows that more than three-fourths of the episodes began with an office visit, while only about 2 percent began with a telephone call. One episode began with a hospital admission. Drugs and laboratory procedures were the most frequently ordered procedures at the first contact.

Only 5 percent of the episodes thah included a telephone call were initiated by a telephone call, and two of every seven episodes which involved a parenteral injection included such an injection at the first contact.

Resource Use

Office procedures accounted for about 60 percent of the RVS units and laboratory procedures accounted for most of the other RVS units coded to episodes of gonorrhea (Table 12-12). Radiology contributed a very small percentage of RVS units coded to gonorrhea episodes. The table does not include any RVS units for drugs.

The distribution of RVS units per episode is shown in Table 12-13. Almost all episodes had some resource use coded to them. The number of RVS units per episode ranged from none to 24 and the mean number of RVS units per episode was 5.1.

Patient Characteristics

About 53 percent of the episodes of gonorrhea occurred among males. Table 12-14 shows that about one-half of the episodes involved people under 25 years of age, while only 12 percent of the episodes involved people over 34 years of age. The age ranged from five years to 63 years and the mean age per episode was 25 years.

During the episodes of gonorrhea, 8.7 percent of the contacts were made by persons who were not Health Plan eligible.

Table 12-15 shows that at the time of the first contact, gonorrhea was the only morbidity in 79 percent of the episodes. About 65 percent of the episodes had no other morbidities present at any contact during the episode (Table 12-16).

At the time of first contact, 72 percent of the males with gonorrhea reported a urethral discharge; 32 percent of the females reported a vaginal discharge. Fifteen percent of episodes reported dysuria and 8 percent reported abdominal pain (Table 12-17). Among the episodes for which duration of symptoms were reported, only 7 percent reported symptoms lasting longer than 14 days.

The complication from gonococcal infection include ophthalmia neonatorum, acute and recurrent salpingitis, epididymitis, prostatitis, and disseminated gonococcal infection. Among these, only salpingitis (eight episodes) and prostatitis (three episodes) were reported. Because there were so few reported complications of these types, it was not possible to analyze such episodes separately.

Provider Characteristics

Table 12-18 indicates that about one-half of the episodes of gonorrhea were seen by an internist at first contact. The remaining episodes began with gynecologists (18 percent), new health practitioners (11 percent), urologists (7 percent), and emergency care physicians (7 percent). The observed pattern of provider specialty at first contact was very similar to that for all contacts during the episodes of gonorrhea.

Medical Care Process Characteristics

Table 12-19 shows that 39 percent of the episodes of gonorrhea involved only one contact with the medical care system. The duration of episodes ranged from one contact to 191 days and the mean duration was 13.4 days.

The episodes of gonorrhea by the year in which they originated are shown in Table 12-20. The gradual yearly increase is most likely due to the increase in Health Plan membership through these years.

Gonorrhea was the primary cause of the contact in 87 percent of the episodes. In all but six of the remaining episodes, it was the first associated morbidity at the time of the first contact for gonorrhea. Thus, gonorrhea appears to have been the major reason for the medical care contact when gonorrhea was diagnosed at the contact. Gonorrhea was an established diagnosis at the time of first contact for 55 percent of the episodes (Table 12-21).

A medical office was the first place of service for more than three-fourths of the gonorrhea episodes. Most of the remaining first contacts for episodes of gonorrhea took place in the emergency room.

Almost 60 percent of first contacts for gonorrhea were walk-in visits, while about 18 percent were regularly scheduled appointments, and about 19 percent were hospital emergency room contacts (Table 12-22). Most of the few remaining first contacts originated by telephone or letter.

Twenty-nine percent of all contacts were walk-in visits and 18 percent were regularly scheduled appointments (Table 12-23). Telephone or letter contacts and RN contacts each accounted for 21 percent of all contacts. Most of the remaining 10 percent of all contacts were accounted for by emergency room visits. After the initial contact most additional contacts consisted of scheduled follow-up visits and telephone calls, probably for the purpose of checking on the results of laboratory studies.

Almost 82 percent of first contacts for gonorrhea occurred during medical office hours. For all episodes, 92 percent of contacts occurred during medical office hours. At the time of first contact for gonorrhea, 96 percent of contacts were asked to return for additional care. That 26 percent of episodes consisted of a single contact suggests of compliance with the return request was less than optimum.

BIVARIATE ANALYSIS

In the subsequent analyses, RVS units have been converted to 1970 dollar costs as described in Section III.

Patient Characteristics

Costs were not related to sex, as the mean cost per episode of gonorrhea was $21.34 for males and $21.53 for females. Costs were, however, significantly related to age. Table 12-24 shows that the mean cost per episode was highest among persons 30 years of age and over.

The mean cost per episode was significantly greater if gonorrhea was the presenting morbidity rather than an associated morbidity (Table 12-25). This difference is probably an artifact of the data recording systems. The cost of an office visit is charged to the presenting morbidity whether or not other morbidities are identified during the visit.

Table 12-26 indicates that, as the number of associated morbidities at first contact increased, the cost per episode decreased probably as a result of the same data recording procedure discussed above. The mean cost per episode was not related to the number of comorbidities present during the episode (Table 12-27). Table 12-28 shows that cost per episode was not related to the presence of other genitourinary tract infections at first contact.

The mean number of dollars per episode was significantly and directly ($r = .61$) related to the length of the episodes (Table 12-29).

Provider Characteristics

The mean cost per episode was not related to the specialty of the provider at first contact (Table 12-30) or to the status of the attending physician at first contact (Table 12-31).

Medical Care Process Characteristics

The mean cost per episode was not related to the place of service at the first contact (Table 12-32) or to the status of the diagnosis at the first contact (Table 12-33).

The mean cost per episode was not related to the type of appointment at first contact (Table 12-34). Also, mean cost per episode did not appear to be related to whether or not a return visit was requested at the time of the first contact.

In summary, the costs of episodes of gonorrhea appeared to be significantly influenced by the following variables:

- age
- duration of the episode
- whether a presenting or associated morbidity at first contact
- the number of comorbidities at first contact

The last two appear to be artifacts of the coding process.

MULTIVARIATE ANALYSIS

Utilization

The first analysis attempted to identify the combination of services and procedures (treatment bundles) that account for the variation in the costs of episodes of gonorrhea. The dependent variable for this analysis was the total dollar costs per episode. The independent variables were various measures of utilization (Attachment A).

Figure 12-1 shows that six specific bundles of care were identified. The different bundles, the number of episodes included in the bundle, and the mean cost per bundle are:

1. 0-4 Physician contacts, 0-2 laboratory services, 0 registered nurse contacts $N = 74$, $Y = \$11.70$
2. 0-4 MD contacts, 0-2 laboratory services, 1 or more RN contacts $N = 27$, $\overline{Y} = \$16.60$

3. 0-4 MD contacts, 2 laboratory services, 1 or more RN contacts $N = 22$, $\overline{Y} = \$22.00$

4. 0-1 MD contacts, 3 or more laboratory services $N = 25$, $\overline{Y} = \$21.20$

5. 2-4 MD contacts, 3 or more laboratory services $N = 33$, $\overline{Y} = \$27.90$

6. 5 or more MD contacts $N = 25$, $\overline{Y} = \$46.70$

Episodes in the most costly treatment bundle (6) were four times as costly as those episodes in the least costly treatment bundle (1). Three utilization measures explained 59 percent of the variation in the costs of episodes of gonorrhea. These were (1) the number of physician contacts, (2) the number of laboratory tests, and (3) the number of RN contacts.

It was previously shown that about 70 percent of the episodes of gonorrhea lasted 14 days or less. To attempt to remove the apparent effect of long duration on episodes costs, an AID analysis was done on episodes lasting two weeks or less (Figure 12-2). Seven treatment bundles were identified. The different bundles, the number of episodes, and the mean costs per episode were:

1. 0-1 laboratory services, 0 RN contacts, 0-1 MD contacts $N = 28$, $\overline{Y} = \$8.90$

2. 0-1 laboratory services, 0 RN contacts, 2-3 MD contacts $N = 16$, $\overline{Y} = \$12.40$

3. 2 laboratory services, 0 RN contacts

$N = 22$, $\overline{Y} = \$14.90$

4. 0-1 laboratory services, 1 or more RN contacts

$N = 24$, $\overline{Y} = \$16.60$

5. 3 or more laboratory services, 0-1 MD contacts

$N = 22$, $\overline{Y} = \$20.00$

6. 2 laboratory services, 1 or more RN contacts

$N = 15$, $\overline{Y} = \$20.40$

7. 3 or more laboratory services, 2 or more MD contacts

$N = 19$, $\overline{Y} = \$26.80$

The same three variables (physician contacts, laboratory tests, and RN contacts) accounted for the variation in the costs of the shorter episodes. These variables accounted for 58 percent of the variation in episode costs.

For the shorter episodes, laboratory tests were the principal predictor of episode costs while in the previous analysis, which included the longer episodes, the number of physician contacts was the principal predictor of episode costs. The total amount of variation explained by these variables in both analysis was almost the same.

Since data concerning drug orders were available for gonorrhea episodes occurring in 1972 and 1973, an AID analysis of these episodes was done. The analysis included, as a variable, whether each episode had none, one, two, three, or more drug orders. Figure 12-3 shows that three variables explained 40.9 percent of the variation in cost: the number of laboratory tests, the number of drug orders, and the number of RN contacts. The parenteral injection costs represent labor and facilities and not drug costs. Since the number of RN contacts closely approximates the number of parenteral injections, drug treatment is clearly a significant component of the costs of episodes of gonorrhea.

Patient, Provider, and Medical Care Provider Characteristics

The patient, provider, and medical care process variables were examined to determine the extent to which they accounted for the variation in costs of episodes of gonorrhea. The dependent variable for the AID analysis was the total costs of each episode. A listing of the independent variables is shown in Attachment B. Duration of episode was not included as a variable.

Figure 12-4 shows that four variables explained 34.4 percent of the total amount of the variation in costs of episodes of gonorrhea: whether or not the episode included regularly scheduled contacts, walk-in contacts, and associated morbidities, and age.

The higher cost episodes were associated with the presence of a regularly scheduled appointment, with the presence of a walk-in appointment, with the absence of associated morbidities, and with episodes among persons 30 years of age and over. The first two results reflect the fact that resource use or costs requires the presence of visits both regularly scheduled and walk-in. The higher cost in the absence of a contact with a comorbidity reflects the coding process that assigns resource use to the morbidities. Because age had the only clear independent influence on episode costs, patient, provider and medical care process variables were not examined by a Log-Linear Multiway Contingency Analysis (LLMCA).

Patterns of Resource Use

One further analysis was undertaken. The analysis attempted to determine if the substantial range of costs per treatment bundle appeared to reflect different patterns of resource use across the various treatment bundles or reflected the more frequent use of the same services and procedures.

The six treatment bundles that were identified from all the episodes of gonorrhea were used in this analysis. In doing so, it must be recognized that the duration of episode was directly related to the mean cost per treatment bundle.

Most episodes in treatment bundles 1 and 2 (lower cost treatment bundles) had contact with a physician. About 80 percent of the episodes with physician contacts had one or two such contacts. Treatment bundle 3 (medium cost bundles) had episodes in each category from none to four physician contacts while about one-third of the episodes in treatment bundle 4 (medium cost bundle) had no physician contacts and the remaining episodes one physician contact. About one-half of the episodes in treatment bundle 5 (higher cost bundle) had two physician contacts.

The lower and medium cost treatment bundles (1-4) were less likely to have a telephone/letter contact than the higher cost treatment bundles (5 and 6). The highest cost treatment bundle was the bundle most likely to have a telephone/letter contact and to have multiple telephone/letter contacts.

The pattern of contacts with RN and contacts for parenteral therapy was very similar within each treatment bundle but differed somewhat across treatment bundles. For example, treatment bundle 1 included episodes with no RN contacts. Two episodes in treatment bundle 1 had parenteral therapy. All episodes in treatment bundle 2 and 3 had at least one RN contact, while more than 95 percent of these episodes had one or more parenteral therapies.

Most episodes in treatment bundles 2 and 3 had one RN contact and one parenteral therapy (PT) contact. About 40 percent of the episodes in treatment bundle 4 had RN and PT contacts and these episodes had one contact for these services. Somewhat more than 50 percent of the episodes in treatment bundles 5 and 6 had RN and PT contacts. Most episodes had one RN and one PT contact.

About 80 percent of treatment bundle 1 had a laboratory procedure, and 60 percent of episodes with laboratory procedures had one procedure. About 90 percent of the episodes in treatment bundle 2 had one laboratory procedure. Episodes in treatment bundle 5 were more likely than episodes in treatment bundle 4 to have four or more laboratory procedures. All episodes in treatment bundle 6 had a laboratory procedure, with 70 percent of the episodes having four or more laboratory procedures.

The drug order data for 1972 and 1973 episodes was cross-tabulated with the six treatment bundles that were identified when all episodes were included. Episodes in treatment bundle 1 included most of the episodes with no drug orders. Forty-four percent of episodes in treatment bundle 1 did not have a drug order. The only other treatment bundle with episodes having no drug orders was treatment bundle 4. In this bundle, 20 percent of the episodes had no drug orders. Episodes with two and three or more drug orders were found in each treatment bundle.

This analysis suggests that with the exception of treatment bundle 6, the highest costly treatment bundle, increased costs of episodes per treatment bundle did not appear to be due to a generally uniform increases in all services and procedures. The findings suggest that some variation in treatment patterns occur as the costs per episode increases. This non-uniform variation involves all services and procedures, although the number of drug orders varies the least. Whether such variation involves substitutable and/or complementary procedures and services and whether such variation leads to qualitative differences in treatment cannot be ascertained from these data.

Summary and Conclusions

Six different bundles of care were identified that accounted for 59 percent of the variation in the costs of episodes of gonorrhea. The costs of these bundles ranged from a low mean cost per episode in bundle 1 of $11.70 to a high mean cost per episode in bundle 6 of $46.70.

With the exception of treatment bundle 6, the increase in the mean costs of episodes of treatment bundles did not appear to be due to more of the same procedures and services. Increased costs per episode did not appear to be linearly related to number of physician contacts, telephone/letter contacts, RN contacts, parenteral therapy contacts, laboratory procedures, or drug orders. Drug treatment was almost always ordered with the exception of treatment bundle 1 (lowest cost bundle). Had more years of drug data been available and had costs been attached to the drug orders, it appears drug treatment would have been a significant factor in episode costs and contributed further to accounting for the variation in episode costs.

While there did appear to be some variation in the treatment of gonorrhea across treatment bundles, the possible explanation for the variation is not clear. First of all, the episodes of gonorrhea selected may not have been homogeneous or of similar severity. The criteria established to identify potentially severe cases of gonorrhea appeared too infrequently among episodes to be used. On the other hand, there was a substantial variation in the duration of episodes of gonorrhea. While the mean length of episode was 13 days, many episodes had durations beyond what might be expected for the normal course of the disease. These episodes could represent complicated episodes and/or treatment failures. However, when episodes with durations of more than 15 days were excluded, seven different treatment bundles were identified with a substantial variation in the range of mean costs per episode in the various treatment bundles. This suggests that there was variation in treatment patterns not accounted for by duration of episode.

Secondly, some of the variation in episode costs could be due to individual physician treatment preferences. There were too few episodes of gonorrhea to examine this possibility. Whatever the explanations for the variations in episode costs, episodes of gonorrhea did not appear to adhere to a standard treatment protocol with little variation in episode costs.

The characteristics of individual patients, with the exception of age, were not significant influences upon episode costs. Increased costs per episode were related to increased age of patient. It would be convenient if this relationship could be explained by an association between advancing age and increasing complications requiring more resources during the episode. However, because so few complications were reported among episodes, this explanation lacks support. It is not clear why this relationship exists.

None of the variation in costs of episodes of gonorrhea was accounted for by physician specialty characteristics. Characteristics of the medical care process which were examined did not help to account for the variation in episode costs.

An episode approach to examining costs of gonorrhea indicated a substantial variation in costs per episode. Different treatment patterns appeared to be partially responsible for the variation in episode costs even though gonorrhea is recognized to have a standard treatment protocol. Patient characteristics, physician specialty characteristics and characteristics of the medical care process are not significant influences upon episode costs. However, individual interphysician variation was not examined in this report.

ATTACHMENT A

Utilization Variables

1. Number of Laboratory Procedures in Episode
   (0, 1, 2, 3, 4 or more)
2. Number of Contacts by Telephone or Letter in Episode
   (0, 1, 2, 3 or more)
3. Number of Physician Contacts in Episode
   (0, 1, 2, 3, 4, 5 or more)
4. Number of Registered Nurse Contacts in Episode
   (0, 1, 2 or more)
5. Number of Parenteral Injections
   (0, 1, 2 or more)
6. Number of Drug Orders in Episode (1972 and 1973)
   (0, 1, 2, 3 or more)

ATTACHMENT B

Patient, Provider, and Medical Care System Variables

1. Sex
2. Age group (< 20 yrs, 20-24, 25-29, 30-34, 35+ yrs)
3. Status of Gonorrhea (presenting, first to fifth associated morbidity)
4. Type of appointment at first contact (regularly scheduled, walk-in, emergency room + other)
5. Status of physician at first contact (regular attending, temporary attending)
6. Status of diagnosis (established, tentative, unknown)
7. Number of associated morbidities at first contact (0, 1, or more)
8. Specialty of provider at first contact (internal medicine, ob-gyn, urology, NHP, emergency surgeon, other)
9. Regularly scheduled appointment(s) in episode (No, yes)
10. Walk-in appointment(s) in episode (No, yes)
11. Contact with internist (No, yes)
12. Contact with ob-gyn (No, yes)
13. Contact with urologist (No, yes)
14. Contact with New Health Practitioner, e.g., physician's assistant (No, yes)
15. Contact with emergency room physician (No, yes)
16. Contact with regular attending physician (No, yes)
17. Contact with temporary attending physician (No, yes)
18. Number of contacts with a comorbidity in episode (0, 1 or more)
19. Genito-urinary tract infection a comorbidity? (No, yes)

TABLE 12-1

Episodes of Gonorrhea by Total Number of Contacts in Episode

Number of Contacts	Number of Episodes	Percent	Cumulative Percent
1	54	26.2	26.2
2	56	27.2	53.4
3	31	15.0	68.4
4	23	11.2	79.6
5	19	9.2	88.8
6	9	4.4	93.2
7-10	10	4.9	98.1
14 or more	4	1.9	100.0
Total	206	100.0	

Range 1-21
Mean 3.2 ± SE 0.2
Median 2.4

TABLE 12-2

Episodes of Gonorrhea by Total Number of Physician Contacts in Episode

Number of Contacts	Number of Episodes	Percent	Cumulative Percent
0	14	6.8	6.8
1	75	36.4	43.2
2	50	24.3	67.5
3	25	12.1	79.6
4	17	8.3	87.9
5	12	5.8	93.7
6 or more	13	6.3	100.0
Total	206	100.0	

Range 0-14
Mean 2.3 ± SE 0.1
Median 1.8

TABLE 12-3

Episodes of Gonorrhea by the Number of Physician Visits in Episode

Number of Physician Visits	Initial Visits		Continuing Visits	
	No.	%	No.	%
0	44	21.4	121	58.7
1 or more	162	78.6	85	41.3
Total	206	100.0	206	100.0

Initial DOVs
Range 0-2
Mean 0.8 ± SE 0.03
Median $0.\overline{9}$

Continuing DOVs
Range 0-8
Mean 0.7 ± SE 0.08
Median $0.\overline{4}$

TABLE 12-4

Episodes of Gonorrhea by Number of Contacts by Phone or Letter in Episode

Number of Contacts by Telephone or Letter	Number of Episodes	Percent
0	118	57.3
1	59	28.6
2	18	8.7
3 or more	11	5.4
Total	206	100.0

Range 0-1
Mean 0.7 ± SE 0.08
Median $0.\overline{4}$

TABLE 12-5

Episodes of Gonorrhea by Number of Laboratory Tests in Episode

Number of Laboratory Tests	Number of Episodes	Percent	Cumulative Percent
0	16	7.8	7.8
1	61	29.6	37.4
2	52	25.2	62.6
3	34	16.5	79.1
4	16	7.8	86.9
5	10	4.9	91.7
6	9	4.4	96.1
7 or more	8	3.8	100.0
Total	206	100.0	

Range 0-11
Mean 2.4 ± SE 0.1
Median 2.0

TABLE 12-6

Number of Specific Laboratory Procedures for Episodes of Gonorrhea

Laboratory Procedure	Number	Percent	Cumulative Percent
G-C culture	212	45.7	45.7
G-C smear	79	17.1	62.8
Blood serology	59	12.7	75.5
Rectal swabs	41	8.8	84.3
Urinalysis	35	7.5	91.8
Urine cultures	27	5.8	97.6
Other	11	2.4	100.0
Total	464	100.0	

TABLE 12-7

Episodes of Gonorrhea by Number of Drug Orders in Episode*

Number of Drugs Ordered	Number of Episodes	Percent	Cumulative Percent
0	18	21.7	21.7
1	19	22.9	44.6
2	26	31.3	75.9
3	11	13.3	89.2
4	7	8.4	97.6
5 or more	2	2.4	100.0
Total	83	100.0	

Range 0-9
Mean 1.8 ± SE 0.2
Median 1.7

*Drug data available for episodes of gonorrhea in 1972 and 1973 only.

TABLE 12-8

Episodes of Gonorrhea by Number of Parenteral Injections in Episode

Number of Injections	Number of Episodes	Percent	Cumulative Percent
0	120	58.3	58.3
1	70	34.0	92.2
2	10	4.9	97.1
3 or more	6	2.8	100.0
Total	206	100.0	

Range 0-13
Mean 0.6 ± SE 0.1
Median 0.4

TABLE 12-9

Episodes of Gonorrhea by Number of Nurse Contacts in Episode

Number of RN Contacts	Number of Episodes	Percent	Cumulative Percent
0	116	56.3	56.3
1	74	35.9	92.2
2 or more	16	7.8	100.0
Total	206	100.0	

Range 1-13
Mean 0.7 + SE 0.1
Median 0.4

TABLE 12-10

Episodes of Gonorrhea by Different Procedures Rendered throughout the Episode

Procedure	Number of Episodes with Procedure	Percent with Procedure
Physician office visits	192	93.2
Laboratory tests	190	92.2
Telephone calls	88	42.7
Parenteral injections	86	41.7
Drug orders*	65	78.3
Hospital admissions	3	1.5

*For 1972 and 1973 episodes only; total number of episodes for this period = 83.

TABLE 12-11

Episodes of Gonorrhea by Different Procedures Rendered at First Contact

Procedure	Number of Episodes with Procedure	Percent with Procedure
Laboratory tests	176	85.4
Physician office visits	161	75.2
Drug orders*	57	68.7
Parenteral injections	25	12.1
Telephone calls	5	2.4
Hospital admissions	1	0.5

*For 1972 and 1973 episodes only; total number of episodes for this period = 83.

TABLE 12-12

RVS Units by Procedure Assigned to Episodes of Gonorrhea*

Procedure	RVS Units	Percent	Cumulative Percent
Office	623	59.1	59.1
Laboratory	421	39.9	99.0
Radiology	11	1.0	100.0
Total	1,055	100.0	

*Excludes oral drugs ordered

TABLE 12-13

Episodes of Gonorrhea by RVS Units in Episode

RVS Units	Number of Episodes	Percent	Cumulative Percent
0	3	1.4	1.4
0.1- 2.9	33	16.0	17.4
3.0- 5.9	112	54.4	71.8
6.0- 8.9	41	19.9	91.7
9.0-11.9	7	3.4	95.1
12.0 or more	10	4.9	100.0
Total	206	100.0	

Range 0-24.0
Mean 5.1 ± SE 0.2
Median 4.4

TABLE 12-14

Episodes of Gonorrhea by Age

Age	Number of Episodes	Percent	Cumulative Percent
5-20	52	25.2	25.2
20-24	62	30.1	55.3
25-29	37	18.0	73.3
30-34	30	14.6	87.9
35 and over	25	12.1	100.0
Total	206	100.0	

Range 5-63
Mean 25.2 ± SE 0.6
Median 23.2

TABLE 12-15

Episodes of Gonorrhea by the Number of Comorbidities at the First Contact for the Episode

Comorbidities	Number of Episodes	Percent
0	163	79.1
1	31	15.0
2 or more	12	5.9
Total	206	100.0

TABLE 12-16

Episodes of Gonorrhea by the Number of Contacts with a Comorbidity in Episode

Number of Contacts	Number of Episodes	Percent
0	133	64.6
1	49	23.8
2 or more	24	11.6
Total	206	100.0

Range 0-5
Mean 0.5 ± SE .06

TABLE 12-17

Episodes of Gonorrhea by the Number of Episodes with a Major Presenting Symptom at the Time of First Contact

Symptom	Number of Episodes	Percent
Urethral discharge	79	38.3 (72% of males)
Vaginal discharge	31	15.1 (32% of females)
Dysuria	31	15.1
Abdominal pain	17	8.2
Other	48	23.3
Total	206	100.0

TABLE 12-18

Episodes of Gonorrhea by Physician Specialty at First Contact for Episode

Specialty	Number of Episodes	Percent	Cumulative Percent
Internal Medicine	107	51.9	51.9
OB-GYN	36	17.5	69.4
NHP	22	10.7	80.1
Urology	15	7.3	87.4
Emergency	14	6.8	94.2
Other*	12	5.8	100.0
Total	206	100.0	

*Includes pediatrics and general surgery

TABLE 12-19

Episodes of Gonorrhea by Length of Episode in Days

Duration (Days)	Number of Episodes	Percent	Cumulative Percent
1 contact	81	39.3	39.3
2-7	38	18.5	57.8
8-14	27	13.1	70.9
15-21	21	10.2	81.1
22-35	15	7.3	88.4
36-49	10	4.8	93.2
50 or more	14	6.8	100.0
Total	206	100.0	

Range 1-191
Mean 13.4 ± SE 1.6
Median 4.9

TABLE 12-20

Episodes of Gonorrhea by Year of First Contact for Episode

Year	Number of Episodes	Percent	Cumulative Percent
1966	1	0.5	0.5
1967	18	8.7	9.2
1968	24	11.7	20.9
1969	17	8.3	29.1
1970	28	13.6	42.7
1971	35	16.9	59.7
1972	43	20.9	80.6
1973	40	19.4	100.0
Total	206	100.0	

TABLE 12-21

Episodes of Gonorrhea by Status of Diagnosis at First Contact

Status of Diagnosis	Number	Percent
Established	114	55.3
Tentative	75	36.4
Unknown	17	8.3
Total	206	100.0

TABLE 12-22

Episodes of Gonorrhea by Type of Appointment at First Contact

Type of Appointment	Number of Episodes	Percent
Regularly scheduled	36	17.5
Walk-in	123	59.7
Emergency Room	39	18.9
Phone, letter, other	8	3.9
Total	206	100.0

TABLE 12-23

Episodes of Gonorrhea by Type of Appointment for all Contacts in Episode

Type of Appointment	Number of Contacts	Percent
Regularly scheduled	119	18.4
Walk-in	189	29.3
Phone or letter	137	21.2
RN only	134	20.7
Emergency Room	64	9.9
Hospital admission	3	0.5
Total*	646	100.0

*One contact is missing

TABLE 12-24

Mean Cost per Episode of Gonorrhea by Age

Age	Mean Cost per Episode	Number of Episodes
< 20 years	$21.09	52
20-24	19.19	62
25-29	17.78	37
30-34	24.06	30
35 years +	29.92	25
Total	21.43	206

$F=3.6$
$p=.008$
$r=.17$
$r^2=.03$

TABLE 12-25

Mean Cost per Episode of Gonorrhea as Presenting vs. First Associated Morbidity at First Contact

Status of Episodes of Gonorrhea	Mean Cost per Episode	Number of Episodes
Presenting morbidity	$22.86	179
1st associated morbidity	11.91	27
Total	21.43	206

F=14.5
p=.0002

TABLE 12-26

Mean Cost per Episode of Gonorrhea by Number of Associated Morbidities at First Contact

Number of Associated Morbidities	Mean Cost per Episode	Number of Episodes
0	$22.67	163
1	19.01	31
2	10.82	12
Total	21.43	206

F=4.4
p=0.01
r=-0.20
r^2=0.04

TABLE 12-27

Mean Cost per Episode of Gonorrhea by Number of Contacts with a Comorbidity During Episode

Number of Contacts	Mean Cost per Episode	Number of Episodes
0	$21.03	133
1	20.25	49
2	26.30	24
Total	21.43	206

F=1.4
p=0.24
r=0.08
r^2=0.006

TABLE 12-28

Mean Cost per Episode of Gonorrhea by Presence or Absence of Genitourinary Tract Infection as a Comorbidity at First Contact

G-U Tract Infection	Mean Cost per Episode	Number of Episodes
No	$20.82	162
Yes	23.67	44
Total	21.43	206

F=1.4
p=0.25

TABLE 12-29

Mean Cost per Episode of Gonorrhea by Duration of Episode

Duration	Mean Cost per Episode	Number of Episodes
1 contact	$13.96	81
1-7 days	18.39	38
8-14	22.06	27
15-21	25.78	21
22-35	34.55	15
36-49	27.60	10
50 days or more	46.69	14
Total	21.43	206

$F=22.5$
$p=0.0000$
$r=0.61$
$r^2=0.37$

TABLE 12-30

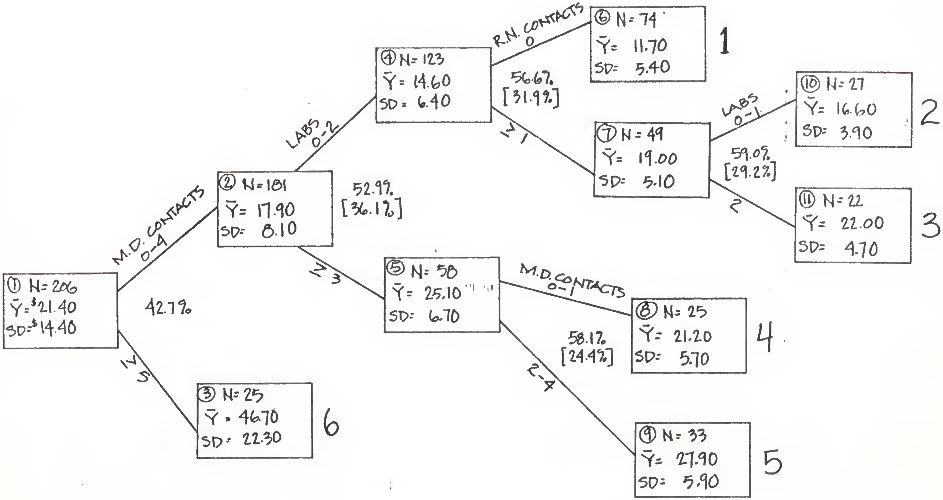
Mean Cost per Episode of Gonorrhea by Specialty of Provider at First Contact

Specialty of Provider	Dollar Cost per Episode	Number of Episodes
Internal medicine	$21.09	107
OB-GYN	20.73	36
Urology	27.94	15
NHP	19.51	22
Emergency	21.41	14
All other	21.97	12
Total	21.43	206

$F=0.7$
$p=0.61$

FIGURE 12-1

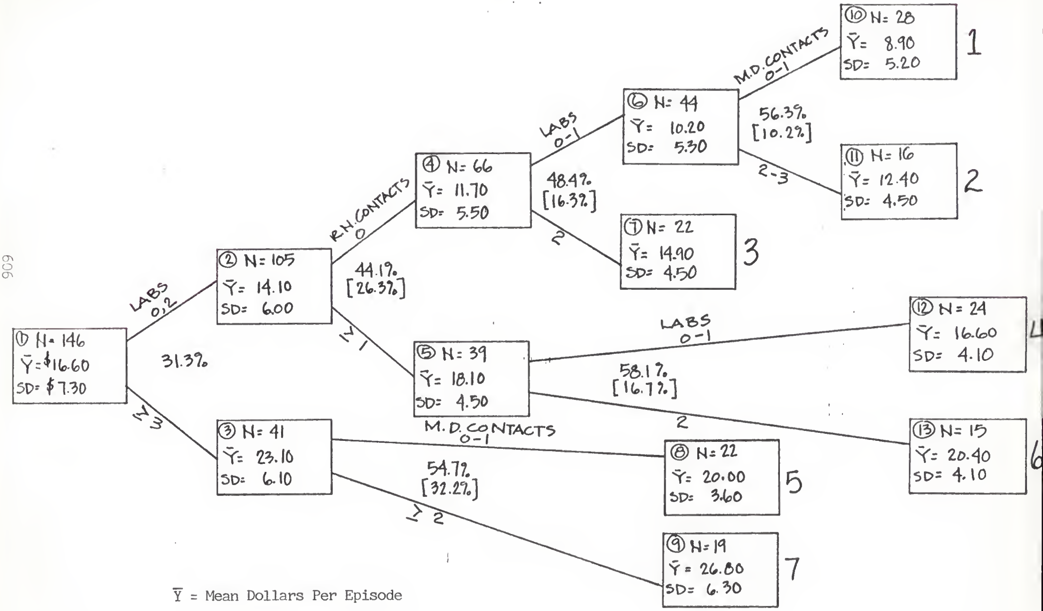
Episodes of Gonorrhea by Utilization Variables



$\bar{Y}$ = Mean Dollars Per Episode

FIGURE 12-2

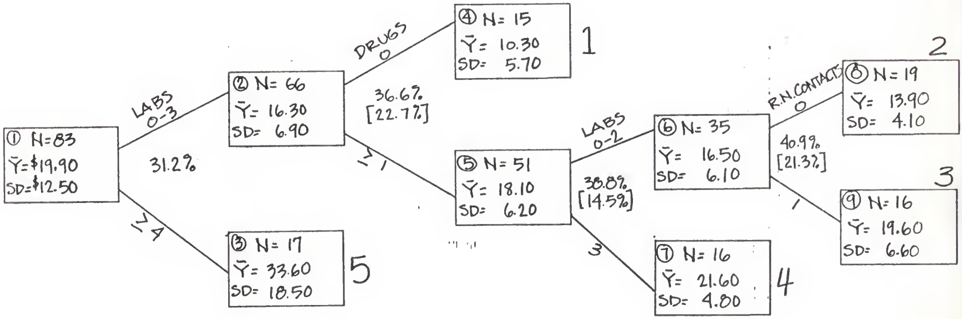
Episodes of Gonorrhea Lasting Two Weeks or Less by Utilization Variables



Ȳ = Mean Dollars Per Episode

FIGURE 12-3

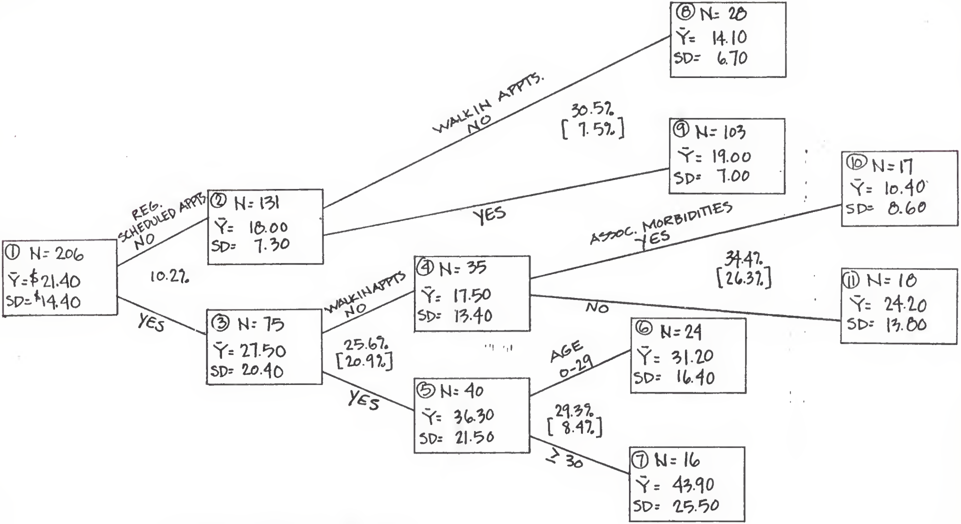
Episodes of Gonorrhea (1972 and 1973) by Utilization Variables



Ȳ = Mean Dollars Per Episode

FIGURE 12-4

Episodes of Gonorrhea by Patient, Provider, and Medical Care System Variables (Duration Excluded)



Ȳ = Mean Dollars Per Episode

SECTION XIII. HEADACHE

Rhesa Lee Penn

ABSTRACT

Episodes of headache included all contacts for care of headache as a symptom and a diagnosis; confirmed migraine contacts were examined separately. Headache was classified as a chronic condition. The duration of the episode was the time between the first recorded contact and the last recorded contact.

The principal analysis was done on 478 episodes of nonspecific headache. These episodes were chosen by selection criteria intended to control for severity and excluded episodes of migraine. Episodes ranged in duration from one day to more than six years; mean duration was 149 days.

The mean number of contacts per episode was two, with the range from one to 24 contacts. Sixty-three percent of episodes consisted of only one contact. The mean cost per episode was $15 with a range of no costs (one episode) to $185.

Eight different bundles of care were identified. These bundles accounted for 59 percent of the variation in costs of episodes of nonspecific headache. The bundles appeared to represent qualitatively different patterns of care. Low cost bundles were associated with care by telephone; medium cost bundles with laboratory tests, office visits, and drugs; and high cost bundles with radiology procedures added.

Patient, provider, and medical care process characteristics were able to explain 18 percent of the variation in

episode costs. It appeared that the presence or absence in the episode of comorbitities, nonphysician contacts, and the status of the diagnosis at first contact had independent and direct influences upon the bundles of care.

I. INTRODUCTION

This report summarizes the findings for episodes of headache. It is based on the computerized medical records of a 5 percent sample of all subscriber units in the KPMCP between September 30, 1966 and December 31, 1973.

II. EPISODE DEFINITION

The initial data file included all medical care contacts where the updated diagnosis was headache (791.0, headache, and 354.0, migraine; International Classification of Diseases, Adapted [ICDA], 7th edition). Also included were contacts with updated diagnoses of tension headache, 791.1, and headache as a symptom rather than as a confirmed diagnosis, T151.[1] In patients with these diagnoses, the headache diagnosis was never changed to a specific condition (e.g., tumor, meningitis, aneurysm, depression). An episode began with a patient's first contact with an updated presenting morbidity of headache and ended with the last such contact during the study period. This approach treated headache as a chronic rather than an acute condition because headache, whether vascular or muscular in origin, is commonly a recurrent condition. Using these criteria, 1,051 episodes of headache were identified.

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[1] Codes 791.1 and T151 were developed by the HSRC to adapt the ICDA to the study of outpatient primary care.

These episodes were subjected to selection criteria designed to maximize the likelihood that episodes represented conditions of comparable severity. Selection criteria were:

1. No trauma-related diagnosis codes (ICDA 800.0-962.9, E802-E904, E910-E998) as an initial diagnosis, symptom, or comorbidity at any contact.

2. No adverse effects of drugs or other therapy (ICDA 963.0-999.9, E905-E908) noted as an initial diagnosis, symptom, or comorbidity at any contact.

3. At the initial contact, migraine or nonspecific headache was the principal reason for the contact.

4. The patient had not had any contacts for care of migraine or nonspecific headache within the Health Plan prior to the initiation of the data system; thus, at the index contact, the episode was coded as a "new" episode.

5. No symptoms potentially associated with CNS tumor (anesthesia, disturbance of coordination, photophobia, paresthesia, or swelling or mass of head) were recorded at any contact.

6. No major central nervous system comorbidity or neurologic comorbidity were present at any contact. Episodes excluded for this reason included those with comorbidities of cerebral arteriosclerosis, glaucoma, general arteriosclerosis, petit mal epilepsy, grand mal epilepsy, other epilepsy, stroke, paralysis agitans, benign neoplasm of the pituitary gland, and ICDA code 355.9, other diseases of the brain.

7. No indication at any time during the episode that the patient received advice or services related to oral contraceptives or hormones.

These criteria resulted in identification of 532 episodes of care for uncomplicated nonspecific headache or migraine. The episodes could have begun before the patient's index contact, that is, the first contact for that condition within the Health Plan. The final contact within the study period marked the end of an episode of care, although the condition may have persisted beyond that time. Thus, episodes of headache reflected periods of care.

Fifty-four episodes had at least one contact with an established diagnosis of migraine, and 478 episodes with nonspecific headache only. Because migraine is a clinically distinct headache-causing condition, these 54 episodes were analyzed separately from those without migraine. The small number of migraine episodes restricted analysis of this condition to a descriptive comparison of patient, provider, medical care process, and utilization characteristics of migraine and nonspecific headache episodes. The 478 nonspecific headache episodes were subjected to bivariate and multivariate analyses.

III. DESCRIPTION OF THE 478 EPISODES OF NONSPECIFIC HEADACHE

A. Patient Characteristics

A comorbidity is any condition other than headache that was present and noted at the time of any headache contact.

Comorbidities were examined because of their potential influence upon the cost of treatment of headache. A majority of episodes, 50.6 percent, had no diseases coexisting with their headache complaint (Tables 13-1 and 13-2). Psychiatric comorbidities and symptoms were present in 11.7 percent of the episodes while 37.7 percent had nonpsychiatric comorbidities. Respiratory, eye, or ear infections or related symptoms were present in 15.9 percent of episodes.

At the index contact, 69.4 percent of episodes had headache as the only symptom. Other symptoms were present in 21.6 percent of episodes, usually as a secondary symptom in addition to headache (Table 13-3). The 103 episodes with other symptoms included 13 with sore neck; 22 with nausea, vomiting, stomach pain, or diarrhea; 15 with fever; 14 with dizziness; and 12 with symptoms of ear or upper respiratory infection. For the 41 percent of episodes in which the symptom duration was ascertained, the mean duration was 22 days (SE 3 days).

Table 13-4 indicates that those who received a diagnosis of T151 (headache as a symptom) at the first contact, always had an "unknown" diagnosis. This was a requisite of the data recording system. Of those who received an initial diagnosis of 791.0 or 791.1, 80.1 percent had an "established" diagnosis at the index contact. Diagnoses of 791.0 or 791.1 were coded as tentative when the physician's chart notes were ambiguous, as with "possible headache" or "headache?". Headache (T151, 791.0, or 791.1) was the presenting morbidity at every contact in 83.5 percent of the 478 episodes.

The mean patient age at the index contact was 33.4 years (Table 13-5). From 19 to 44 years accounted for 52.9 percent of episodes. Persons under 12 years of age accounted for 11.1 percent of the episodes; only 5.2 percent of episodes involved persons over 65 years of age. Most episodes, 70.9 percent, were among females. From 1967 to 1970, 8.3 persons thousand health plan members had contacts for nonspecific headache; from 1971 to 1973, 11.4 persons per thousand members had contacts for nonspecific headache.

Single-day episodes comprised 63.4 percent of all nonspecific headache episodes (Table 13-6). Thirteen percent of all episodes lasted one or more years. The mean episode duration was 149 days.

B. Provider Characteristics

Among the episodes of nonspecific headache, 96.2 percent involved at least one contact with a physician. The mean number of physician contacts was 1.9; 7.9 percent of episodes had five or more physician contacts. Of the 6.5 percent of episodes with nonphysician contacts, over one-half percent included no contacts with a physician. A majority of episodes with nonphysician contacts included contacts with a physician assistant.

At the index contact, 49.4 percent of episodes contacted a regular attending physician; the remainder contacted a temporary attending physician (Table 13-7). In 2.7 percent of episodes, there was at least one contact with a consultant.

Table 13-8 shows that 70.5 percent of all episodes began with an internist contact. Pediatrician contacts began 13.8 percent of all episodes. Over the entire episode, internists and pediatricians accounted for 84 percent of all contacts; obstetrician/gynecologists and new health practitioners accounted for another 6 percent of all contacts (Table 13-9).

Internists were the only specialty in 65.3 percent of all episodes. In 13.2 percent of the episodes, pediatricians were the only specialty (Table 13-10). Ten percent of all episodes included contacts with providers of two or more specialty types. In 5.6 percent of episodes, there was at least one contact with a surgeon or an emergency care surgeon.

C. Medical Care Process Characteristics

In 97.5 percent of episodes, the patient was eligible for Health Plan coverage at one or more contacts during the episode.

The index contact was during regular medical office hours in 83.9 percent of all episodes. There was at least one contact out of regular medical office hours in 22.8 percent of episodes. Among these 109 episodes, 52.3 percent included only contacts outside regular hours.

At the index contact, 32.4 percent of patients were requested to return for further care (Table 13-11). Most commonly, the patient was requested to return to a physician (17.8 percent). Nearly one-tenth of all patients were requested to return for radiology. Of the 155 patients who received at least one request to return for further care of headache, 45.2 percent failed to return.

D. Utilization of Services

The mean total number of contacts per nonspecific headache episode was 2.16, with a range of one to 24 (Table 13-12). Included in this total were regularly scheduled and walk-in medical office visits, emergency room visits, telephone calls or letters to or from the patient, and a small "other" category. These contacts were counted if headache was either the presenting morbidity (the primary reason for the contact) or an associated morbidity (a finding made during a contact for another condition). No episode included any hospital admissions.

The initial contact was a regularly scheduled medical office visit in 20.3 percent of episodes (Table 13-13), and 36 percent of all episodes included at least one regularly scheduled medical office visit (Table 13-12). Overall, regularly scheduled medical office contacts were 30 percent of total contacts. In 15.3 percent of episodes, all contacts were regularly scheduled medical office visits (Table 13-14).

The initial contact was a walk-in medical office visit in 42.3 percent of episodes (Table 13-13), and 49.6 percent of episodes included at least one walk-in office contact (Table 13-12). Walk-in medical office contacts were 32 percent of all contacts; 28.5 percent of episodes consisted solely of walk-in contacts (Table 13-14).

At least one medical office contact was present in 71.5 percent of all episodes. Medical office contacts were 62 percent of all contacts. In 50.4 percent of all episodes, all contacts occurred in the medical office.

An emergency room contact was the intial contact in 9.4 percent of the episodes. Overall, 12.6 percent of episodes included one or more emergency room contacts. Emergency room contacts were the only type of contacts in 5.9 percent of episodes.

In 28 percent of episodes, the initial contact was a telephone call or letter; 41 percent of all episodes included one or more such contacts, virtually all of which were telephone calls. In 21.5 percent of episodes, all contacts were telephone contacts.

In 15.3 percent of episodes, there was at least one routine physical examination performed (Table 13-15). Of the 73 episodes that included a physical examination, 29 percent were composed solely of physical examinations. That is, headache was noted only at the time of routine physical examinations.

Most episodes, 74.5 percent, had at least one initial or follow-up medical office or emergency room visit at which headache was the presenting morbidity, causing the cost of that visit to be charged to headache (Table 13-16). The mean number of such contacts was 1.18, with a range from zero to six. In 52.9 percent of episodes, there was a single office visit charged to headache; in 14.9 percent, there were two such visits; only 6.7 percent had at three or more office visits for headache.

There was at least one drug-related telephone call in 20.3 percent of all episodes, (Table 13-17). Eye-related office visits and procedures were done in 3.1 percent of episodes; parenteral therapy occurred in 2.9 percent of episodes. Few received mental health visits or physical therapy.

Laboratory tests were performed in 11.5 percent of headache episodes (Table 13-18). Blood counts were the most common procedures. Of those who received laboratory tests, 73 percent received blood counts, urine tests, or cultures commonly used to detect or monitor infection (Table 13-19).

At least one radiology procedure was performed in 13.6 percent of all episodes. Almost all were x-rays or scans of the head or neck (Table 13-20). X-rays of the skull and of the cervical spine were the most commonly given radiology procedures.

There was at least one drug order in 64.2 percent of headache episodes in 1972-1973 (Table 13-21). The drug type most commonly ordered was non-narcotic analgesics, in 33.7 percent of episodes. Next in frequency were orders for sedatives and minor tranquilizers, in 22.6 percent of episodes. Narcotic analgesics were ordered in 16.3 percent of episodes.

In 11.6 percent of episodes, major and minor tranquilizers and antidepressants (psychoactive drugs) were the only drug types ordered (Table 13-22). Psychoactive with another drug type were ordered in an additional 13.7 percent of episodes. Among the episodes without psychiatric comorbidities, 23 percent received psychoactive drug orders while 53 percent of those with psychiatric comorbidities received psychoactive drug orders.

The mean dollar cost per headache episode, exclusive of drug costs, was $14.97; costs ranged from zero dollars (one episode only) to $184.50 (Table 13-23). Office visits accounted for 64.7 percent of total costs, and radiology procedures accounted for 13.8 percent of costs.

IV. COMPARISON OF 478 NONSPECIFIC HEADACHE EPISODES AND 54 MIGRAINE EPISODES

A. Patient, Provider, and Medical Care Process Characteristics

Of the patients with migraine episodes, 72.2 percent were aged 19-44, while 52.9 percent of patients with nonspecific headache were in this age group (Table 13-24). At the index contact, 25.9 percent of migraine episodes had one or more abdominal or visual symptoms commonly associated with classic migraine; only 4.2 percent of nonspecific headache episodes included these symptoms (Table 13-25). The diagnosis of migraine was established at the first contact of 68.5 percent of migraine episodes.

The sex distribution for episodes of migraine was similar to that for nonspecific headache episodes. The prevalence of comorbidities, including allergy, infection, and psychiatric disorders, was similar for both groups of episodes, as was the proportion of episode contacts in which headache of any type was the presenting morbidity.

At the index contact, 18.5 percent of migraine patients contacted an ophthalmologist, compared to 2.9 percent of nonspecific headache patients (Table 13-26). Migraine episodes were less likely to begin with an internist contact than were episodes of nonspecific headache. Over the entire episode, contacts with an emergency care surgeon, an ophthalmologist, or a consultant were more likely to occur in migraine episodes than in nonspecific headache episodes (Table 13-27). Over the entire episode, 65.3 percent of nonspecific headache episodes included only internist contacts, while 37 percent of migraine episodes included only internist contacts.

Similar proportions of migraine and nonspecific headache episodes had at least one contact with providers of these specialties: obstetrics/gynecology, orthopedics, general surgery, ear/nose/throat, mental health, new health practitioners, pediatricans, and internists.

There was no significant difference between migraine and nonspecific headache episodes in the proportion of index contact orders to return for care. Likewise, both groups of episodes were similar in the presence of Health Plan-ineligible contacts, and in the proportion of total contacts that were regularly scheduled office visits, walk-in office visits, emergency room contacts, or physical examinations.

The mean duration of nonspecific headache episodes was 149 days, while the mean duration of migraine episodes of care was 389 days (Table 13-28). Of the nonspecific headache episodes, 63.4 percent lasted one day, while 35.2 percent of migraine episodes lasted a single day. Of the migraine episodes, 31.5 percent lasted one or more years, while 13 percent of nonspecific headache episodes lasted one or more years.

B. Utilization

Migraine episodes had a mean of 3.7 contacts, including 2.1 medical office contacts and 1.1 telephone/letter contacts; nonspecific headache episodes had a mean of 2.1 contacts, including 1.3 medical office contacts and 0.6 telephone/letter contacts (Table 13-29). Of the migraine episodes, 35.2 percent had four or more contacts, while 12.8 percent of nonspecific headache episode contacts had four or more contacts.

No hospital admissions occurred in nonspecific headache episodes, while 3.7 percent of migraine episodes included a hospital admission (Table 13-30). Emergency room contacts, eye-related office visits and procedures, and parenteral therapy were more frequent in migraine episodes than in nonspecific headache episodes. Migraine patients received more narcotic analgesics, more antivertigo/antinausea drugs, and fewer non-narcotic analgesics than nonspecific headache episodes. While more migraine patients than nonspecific headache patients received antimigraine drugs, such drugs were ordered in only 14.8 percent of migraine episodes.

Migraine and nonspecific headache episodes were similar in the frequency of physical therapy, mental health office visits, physical examinations, and drug-related telephone calls. Migraine and nonspecific headache episodes received similar numbers of orders for antidepressants and major and minor tranquilizers, steroids, antispasmodics, and decongestants. Utilization of laboratory tests and radiology procedures was similar for migraine and for nonspecific headache.

The mean outpatient cost of migraine episodes, exclusive of drug costs, was $22.26, significantly above the $14.97 mean cost per episode of nonspecific headache (Table 13-31). Higher telephone and letter, office visit, and office procedure costs accounted for the difference in overall costs.

V. SUMMARY OF KEY DESCRIPTIVE FINDINGS

1. Among episodes of nonspecific headache, one-half had no disease comorbidities. Psychiatric comorbidities and symptoms were present in 11.7 percent of episodes, while 15.9 percent had respiratory, eye, or ear infections or related symptoms.

2. At the first contact in 69.5 percent of nonspecific headache episodes, headache was the only symptom noted.

3. For nonspecific headache, the mean patient age at the index contact was 33.4 years. Seventy-one percent of patients were female.

4. Single-contact episodes were 62.3 percent of all nonspecific headache episodes; 13 percent lasted one or more years.

5. Most contacts for nonspecific headache, 93.7 percent, were with physicians.

In 65.3 percent of episodes, internists were the only specialty contacted; 13.2 percent included only contacts with pediatricians.

6. At the index contact, 32.4 percent of nonspecific headache episodes were instructed to return for further care; 45.2 percent of these failed to do so.

7. The mean number of contacts per episode of nonspecific headache was 2.1, with a range of one to 24. Medical office contacts accounted for 62 percent of all nonspecific headache contacts. The majority of medical office contacts were walk-in visits. At least one medical office contact was present in 71.5 percent of all episodes, while 12.1 percent of episodes had three or more medical office contacts. There were no hospitalizations for nonspecific headache. At least one emergency room contact was present in 12.6 percent of all episodes. In 21.5 percent of episodes, all contacts were telephone contacts. Few episodes received eye-related services, mental health visits, or physical or parenteral therapy. No spinal taps were performed.

8. Laboratory procedures, a majority of which were blood counts, were performed in 11.5 percent of nonspecific headache episodes. Only 1.7 percent of episodes included an electroencephalogram. Radiology procedures, almost all of which were x-rays or scans of the head or neck, were done in 13.5 percent of episodes.

9. In 64.2 percent of nonspecific headache episodes, there was at least one drug order. The most commonly ordered

types of drugs were analgesics and sedatives/minor tranquilizers.

10. The mean dollar cost per episode of nonspecific headache, exclusive of drug costs, was $14.97. Office visit costs accounted for 64.7 percent of these costs; another 13.8 percent was due to radiology costs.

11. Patients with migraine were more likely to be between ages 19 and 44 at the index contact than were nonspecific headache patients. Visual and gastrointestinal symptoms commonly associated with classic migraine were present at the index contact of 25.9 percent of migraine episodes, and 4.2 percent of nonspecific headache episodes. Episodes of migraine and of nonspecific headache had a similar sex distribution, and similar prevalence of comorbidities, including allergy, infection, and psychiatric conditions.

12. Migraine episodes were more likely to include contacts with emergency care surgeons, ophthalmologists, and consultants than were episodes of nonspecific headache.

13. Episodes of migraine and of nonspecific headache were equally likely to include an index contact instruction to return for further care. Both types of episodes included similar proportions of walk-in and emergency room contacts.

14. The mean duration of migraine episodes was 389 days, while the mean duration of nonspecific headache episodes was 149 days. Episode duration was a year or more in 31.5 percent of migraine episodes, and 13 percent of nonspecific headache episodes.

15. The mean total number of contacts in migraine episodes was 3.7, while nonspecific headache episodes averaged 2.1 contacts. Medical office, emergency room, and telephone/ letter contacts were all more prevalent in migraine episodes than in nonspecific headache episodes, as were eye-related procedures, parenteral therapy, and hospitalization. Migraine episodes received more narcotic analgesic and antivertigo/ antinausea drug orders, fewer non-narcotic analgesic orders, and similar number of psychoactive drug orders as did nonspecific headache episodes. The two types of episodes had simlar total numbers of drug orders, and similar use of laboratory and radiology procedures. The mean outpatient cost of migraine episodes, exclusive of drug costs, was $22.30, 49 percent higher than the $14.97 mean cost of nonspecific headache episodes.

VI. BIVARIATE ANALYSIS OF EPISODES OF NONSPECIFIC HEADACHE

This section examines how resource use, measured by dollar cost per episode, varied as a function of selected patient, provider, medical care process, and utilization variables.

A. Patient Characteristics

Patients with allergy, psychiatric comorbidities, noninfectious head or neck comorbidities, and miscellaneous disease comorbidities had significantly higher episode costs than those without such comorbidities (Tables 13-32 and 13-33). Episodes without any comorbidities had significantly lower episode costs than those with comorbidities. It appears the presence of life-threatening or severe comorbidities was not associated with significantly higher episode costs. Episodes with nonspecific headache as the presenting morbidity at all contacts had significantly lower costs than other episodes (Table 13-34). This was because 75 percent of episodes in which headache was always the presenting morbidity were single contact episodes, while all episodes with any contacts in which headache was not the presenting morbidity were multiple-contact episodes.

Episodes with tentative and established diagnoses at the first contact were more costly than those with the diagnosis unknown at the index contact (Tables 13-35 and 13-36).

Episodes among persons 35 to 54 years of age at the index contact were most costly, followed by episodes with patients 19 to 34 years of age (Table 13-37). Costs were lowest for episodes with persons under 19 or over 55 year of age.

Episode costs increased with increasing episode duration (Table 13-38). Mean costs ranged from $9.10 for single-day episodes to $34.30 for episodes lasting a year or more. Duration explained 26 percent of the variation in cost of care for nonspecific headache.

Patient sex, index contact symptoms, and year of index contact were not significantly related to cost.

B. Provider Characteristics

Episodes with ophthalmology, surgery, or emergency care surgery contacts at the index contact had higher costs; costs were lower for those whose episodes began with an obstetrician, pediatrician, orthopedic, or ear/nose/throat specialist contact (Table 13-39). Table 13-40 shows that episodes with an obstetrician contact had significantly lower costs than other episodes. This was true despite a bias, inherent in dichotomizing episodes by the presence or absence of a certain type of contact, toward multiple contacts and higher costs for episodes with the specified type of contact.

For multiple-contact episodes, costs were significantly higher when physical therapist, mental health/social worker, or orthopedist contacts were present (Table 13-41). Multiple-contact episodes with a consultant contact had significantly higher costs that those without such contacts (Table 13-42). The presence or absence of other provider types did not affect costs of multiple-contact episodes.

Neither the presence of a nonphysician provider at the index contact, nor the status of the attending provider had a significant association with episode cost.

C. Medical Care Process Characteristics

Episodes with the index contact during regular medical office hours had higher costs than other episodes (Table 13-43).

Episodes in which the patient was requested at the index contact to return to a physician, or for laboratory or radiology procedures, had significantly higher costs than episodes without such return requests (Table 13-44).

For multiple-contact episodes, the proportion of contacts which occurred in the medical office or emergency room, the proportion of contacts that were walk-in or regularly scheduled, and the proportion which included a physical examination did not have a significant relation to episode costs.

D. Utilization

Episodes which began with a telephone or letter contact had lower mean costs than those which began with a visit to the medical office or the emergency room (Table 13-45).

Episodes with only noninfection-related laboratory tests had a mean cost of $50.90; those with infection-related laboratory procedures were less costly (Table 13-46). Episodes without laboratory tests were least costly.

Episodes with psychoactive drug orders, including those with orders for sedatives and minor tranquilizers, had significantly higher costs than those without such drug orders (Table 13-47). The presence or absence of orders for narcotic analgesics, non-narcotic analgesics, or other nonpsychoactive drug orders did not affect the cost of episodes of nonspecific headache. Episodes with no drug orders had costs similar to those with only nonpsychoactive drug orders (Table 13-48).

Table 13-49 shows the relationships between medical care utilization and resource use for episodes of nonspecific headache. The number of medical office contacts explained 62 percent of cost variation among episodes. The therapy-related procedure which explained the highest proportion of cost variation was the number of drug-related telephone calls. The diagnostic procedures most strongly associated with variation in cost were head or neck x-rays, scans, or EEGs. The number of drug orders explained 16 percent of cost variation.

E. Summary of Bivariate Analysis of Episodes of Nonspecific Headache

1. Costs were highest for patients with psychiatric comorbidities or symptoms, and lowest for those without comorbidities.

2. Costs were higher for patients with a "tentative" or "established" diagnosis of headache at the index contact, and lower for those with an "unknown" index contact diagnosis.

3. Patient sex did not affect episode costs.

4. Increased episode duration was associated with statistically significant higher episode costs.

5. Patients 35 to 54 years of age had higher mean costs per headache episode than older or younger patients.

6. Episodes which began with surgeon, emergency care surgeon, or orthopedist contacts had high costs. Presence of an obstetrician contact was associated with significantly lower costs. Among multiple-contact episodes, costs were significantly higher when contacts with a physical therapist, consultant, orthopedist, or mental health/social worker provider were present.

7. Costs were higher for episodes in which the patient was instructed at the index contact to return for further care.

8. Costs were higher for episodes with multiple medical office contacts; head or neck x-rays, scans, or EEGs;

noninfection-related laboratory tests; psychoactive drug orders; and drug-related telephone calls. Costs were lower for episodes which began with a letter or telephone call.

VII. MULTIVARIATE ANALYSIS

A. Automatic Interaction Detection (AID)

This technique is used to identify the combinations of specific components of utilization (e.g., office visits, laboratory and radiology procedures, telephone calls) which best accounted for variation in episode costs. This procedure is also used to define the combinations of patient, provider, and medical care process characteristics which best accounted for the variation in cost of episodes of nonspecific headache.

1. Utilization

The dependent variable was total cost per episode, excluding drug costs. Predictor variables are shown in Table 13-50; results are shown in Figure 13-1. The presence or absence of an EEG or an x-ray or scan of the head or neck accounted for 35.2 percent of the cost variation among episodes. An additional 23.6 percent of the variation was accounted for by the presence of combinations of initial and follow-up office visits for headache, drug-related and other telephone calls, and laboratory tests. Overall, the analysis explained 58.8 percent of cost variation among episodes. Eight bundles of care were defined. The bundle with the lowest mean cost per episode ($1.26), included episodes where all contacts were telephone calls. Most of these episodes, 89.3 percent, consisted of a single telephone call. Drug orders were present in 54.1 percent of these episodes. The bundle with the highest mean cost per episode ($57.69), included episodes that received a head or neck x-ray, scan, or EEG, along with at least one drug-related telephone call. Of these episodes, 68.9 percent included three or more medical office contacts, and all included multiple drug orders.

Table 13-51 shows the different bundles of care for nonspecific headache. The mean number of medical office contacts and drug orders per episode generally increased with bundle cost. The largest mean number of drug orders per episode was present in episodes with the sixth or eighth bundles, which included at least one drug-related telephone call along with other resource use. Among the episodes in the three lowest cost bundles, no radiology procedures were done. There were no laboratory tests among episodes in the two lowest cost bundles. The largest number of laboratory procedures per episode was among episodes in the third bundle, a relatively low cost bundle defined by the presence of none or one medical office contacts and one or more laboratory procedures per episode. The different bundles of care embodied widely varying types of resource use per episode: all telephone contacts, multiple laboratory tests with few office visits, multiple office visits, and use of head or neck x-rays or scans. Large differences in the mean duration of episodes within each bundle suggest that certain bundles were commonly for acute, nonrecurrent headache, while others were common for headaches which caused medical care contacts for one or more years.

The 478 episodes of nonspecific headache and the 54 established migraine episodes appear to have different treatment patterns (Table 13-52). No migraine episodes consisted solely of telephone contacts, while 21.5 percent of nonspecific headache episodes did. Migraine episodes were more likely to have multiple headache-related office visits, and less likely to have a head or neck scan, x-ray or EEG than episodes with nonspecific headache episodes.

2. Patient, Provider, and Medical Care Process Characteristics

This analysis, using total costs per episode as the dependent variable, examines how different combinations of patient, provider, and medical care process variables affected the intensity of resource use. Variables used are shown in Table 13-53, and results are shown in Figure 13-2. The most important variable, which accounted for 9.7 percent of total variation in cost, was the presence or absence of nonphysician contacts in the episode. The remaining 8.4 percent of cost variation was accounted for by the presence or absence of comorbidities, the specialty of the physician at the index contact, whether the index contact diagnosis was unknown or tentative or established, and by the combination of symptoms present at the index contact. Overall, this analysis explained 18.1 percent of cost variation in episodes of headache.

The most expensive subgroup of episodes included those with nonphysician provider contacts. Higher episode costs were also associated with these characteristics: comorbidities present, index contact with an orthopedist or surgeon, index contact diagnosis established (rather than tentative or unknown), and headache as the only symptom present at the index contact. This suggests that both provider type and the nature of the patient's illness affected costs of care for nonspecific headache.

B. Log-linear Multiway Contingency Analysis (LLMCA)

Using the variables identified in the AID analyses, the LLMCA was used to identify the relative importance of two-factor and higher-order interactions, and to test the fit of each given model to the data. In this analysis, the eight bundles of care identified in the AID analysis were treated as a single variable with eight possible values; these bundles of care are listed in Table 13-54. The five patient, provider, and medical care process variables identified by AID analysis and listed in Table 13-55 were entered in an effort to determine if they characterized the different bundles of care.

Table 13-56 shows the significant two-way relationships between the patient, provider, and medical care process variables and the bundle of care chosen. Episodes with at least one nonphysician contact were less likely to be in the two lowest cost bundles than were those consisting solely of physician contacts. Episodes with nonphysician contacts were more likely to be in the highest cost bundle of care than were episodes with only physician contacts. Episodes without comorbidities were more likely than others to be in the lowest cost bundle, and less likely to be in a lower cost bundle with multiple office visits charged to nonspecific headache. Episodes with an "unknown" index contact diagnosis status were more likely than others with a "tentative/established" diagnosis to be in the lowest cost bundle.

Significant interactions among patient, provider, and medical care process variables are shown in Table 13-57. Episodes beginning with an internist or obstetrician contact were less likely to include a contact with a nonphysician. By definition, an episode beginning with a physician assistant contact included at least one nonphysician contact. Episodes beginning with a pediatrician contact were more likely to have an "unknown" than a "tentative" or "established" index contact diagnosis. Episodes which began with an internist or obstetrician contact were more likely to have headache as the only symptom at the index contact. Episodes without symptoms coded at the index contact were more likely to include a contact with a nonphysician, and were more likely to have a "tentative" or "established" index contact diagnosis than an "unknown" diagnosis. Episodes with headache coded as the sole index contact symptom were more likely to have only physician contacts, to have no comorbidities, and to have an "unknown" index contact diagnosis. Episodes with symptoms other than headache present at the index contact were more likely to have comorbidities present in the episode.

Figure 13-3 shows the pattern of significant two-way interrelationships between the episodes within the bundles of care and patient, provider, and medical care process variables. This model was adjusted for all three-way interactions. This model shows that the presence or absence of comorbidities in the episodes, the presence of a nonphysician contact in the episode, and the status (unknown or tentative/established) of the index contact diagnosis all had separate, direct influence on the bundle of care chosen. Provider specialty at the index contact was related to the status of the index contact diagnosis and, not surprisingly, to the presence or absence of a nonphysician contact in the episode. The type of symptom present at the index contact was related to the presence or absence of a nonphysician contact, the unknown or tentative/established status of the index contact diagnosis, provider specialty at the index contact, and--in part by definition--to comorbidity. The characteristics of the patient's disease and the type of provider interacted to influence the bundle of care chosen.

VIII. SUMMARY AND CONCLUSION OF ANALYSIS OF NONSPECIFIC HEADACHE

A. Episode Definition

Episodes of nonspecific headache were defined when headache was the principal complaint at the index contact, and when trauma, adverse drug reactions, or central nervous system diseases were not present as comorbidities at any contact. Stratification of the episodes was performed by age, sex, and the presence or absence of infectious, psychiatric, and hypertension comorbidities. Migraine episodes were examined separately.

This attempt to define homogenous episodes of nonspecific headache - headache not clearly attributable to organic disease - was ony partly successful. Although 63.4 percent of episodes lasted a single day, the mean episode duration was 149 days; 26.5 percent of episodes lasted over one month. This suggests that the majority of the 478 nonspecific headache episodes were acute, nonrecurrent headache. Future approaches should attempt to separate headaches into those acute, nonrecurrent headaches and those chronic, recurrent headaches. Detailed information on the location, character, and intensity of the pain was unavailable; this information would have been useful in identifying specific types of headache, such as by separating cluster headaches from simple tension headaches. Too few episodes were available to permit separate analyses of episodes with psychiatric or infectious comorbidities, or of pediatric or geriatric patients.

B. Bundles of Care

Outpatient dollar cost, exclusive of drug costs, was the resource use measure for this condition. Eight bundles of care were defined; the choice among them explained 58.8 percent of all variation in episode costs.

The different bundles of care appeared to represent qualitatively different patterns of care for nonspecific headache. The lowest cost bundle consisted of episodes with all headache contacts by telephone. Medium cost bundles consisted of combinations of laboratory tests, office visits, and drug related telephone calls. Higher cost bundles generally included a head or neck x-ray or EEG or scan. The different bundles were associated with mean episode durations ranging from 17 to 822 days, suggesting that variations in the underlying conditions may have influenced which bundle the episode received.

Several aspects of these bundles of care deserve further examination. In 54.1 percent of episodes consisting solely of telephone calls, there were one or more drug orders. This poses two questions: on what basis was the drug order made, and whether there were other contacts not included in the data that should have been examined as part of these episodes of care. The largest mean number of laboratory tests per episode occurred in relative low cost bundle. Was the use of several low cost procedures due to the patient's condition dictating the appropriateness of such test (as in the use of cultures and blood counts for infection), or was this due to a provider preference for low cost laboratory diagnostic work-ups rather than high cost radiology diagnostic work-ups? The bundle which included an office visit with a head or neck x-ray or EEG or scan, was associated with the shortest mean duration of any bundle. It was probably given when the initial condition caused physician concern about organic disease.

C. Influence of Patient, Provider, and Medical Care Process Characteristics on Resource Use

Several patient characteristics and provider characteristics appeared to interact in determining the level of resource use. Costs were higher for patients with comorbidities than for those without comorbidities, indicating that those with a coexisting illness were more likely to receive services for their headache. Among those with comorbidities, costs were significantly higher for those with psychiatric comorbidities than for those with other comorbidities. The prescribing of psychoactive drugs was associated with significant higher costs. Sedatives, tranquilizers, and antidepressants are not specific therapy for headache; abuse of or withdrawal from these drugs can cause or intensify headaches. The question arises whether psychoactive drugs were ordered because of recurrent or severe headache, or whether use of these drugs led to severe, recurrent headache. Among multiple-contact episodes, costs were significantly higher when orthopedist or physical therapist contacts were present, suggesting that the presence of musculoskeletal disorders increased the cost of headache treatment. Costs were significantly lower when there was an obstetrician contact in the episode. Further examination of data would be needed to determine whether this was due to the type of patients or illnesses seen by obstetricians, or due to their specialty-determined patterns or practice.

TABLE 13-1

Frequency of Headache Episodes
with Comorbidities at One or More Contacts

Comorbidity*	N	Percent of Episodes with the Comorbidity
No comorbidities at any contact	242	50.6
Comorbidities	236	49.4
Including:		
1. Allergy	8	1.7
2. Menstrual/menopausal conditions	13	2.7
3. Hypertension	29	6.1
4. Severe or life-threatening comorbidities	18	3.8
5. Psychiatric comorbidities or symptoms	56	11.7
6. Head/neck infections, related symptoms	76	15.9
7. Other head/neck comorbidities, symptoms	58	12.1
8. All other comorbidities	131	27.4

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*Comorbidity groups denote these conditions (7th ICDA codes, as adapted by the HSRC):

1. Allergy: 2400-2449 - hay fever, asthma, eczema, urticaria.
2. Menstrual-menopausal conditions: 6350-6376 - menopausal and post-menopausal symptoms, premenstrual tension, dysmenorrhea, absence of menstruation.
3. Hypertension: 4470 - essential benign hypertension.
4. Severe or life-threatening comorbidities: 1770, 2030, 2720, 2741, 4209, 4113, 4332, 4341, 4349, 5810, 5840, 5910, 5920, 6020, 6040, 6260, 6480, 7100 - cancer, adrenal cortical hypofunction, anterior pituitary hyperfunction, heart disease, liver cirrhosis, nephritis, cholelithiasis, urinary calculi, pelvic inflammatory disease, threatened abortion.
5. Psychiatric comorbidities and symptom: 3012-3269, T076, T099, Y092- psychophysiologic reactions, anxiety, depression, compulsiveness, other neuroses, alcoholism, social and marital problems.
6. Head/neck infections and related symptoms: 510, 3702, 3900-3940, 4700-5139, 7827, 7833, T010, T230, T261-T270, T284, T290, T294, T311, T335, T410, T701 - strep throat, conjunctivitis, otitis, labyrinthitis, URI/influenza/sinusitis/pharyngitis, fever, ear and respiratory symptoms.
7. Other head/neck comorbidities and symptoms: 2400-2430, 2520, 3969, 5179, 7262, 7411, T020, T221-T260, T268, T277, T283, T331, T332, T731, T741, T771 - hay fever, asthma, urticaria, toxic diffuse goiter, torticollis, shoulder pain/bursitis, dizziness/lightheadedness, eye symptoms, tinnitus, nose bleed, sore neck, suboccipital pain, noninfectious ear and respiratory conditions.
8. All other comorbidities: any disease not mentioned in groups 4-7.

TABLE 13-2

Combinations of Comorbidities* in Headache Episodes

Comorbidity*	N	Pct.
Psychiatric comorbidities or symptoms	56	11.7
All other comorbidities, without psychiatric comorbidities	180	37.7
No disease comorbidities	242	50.6
	478	100.0

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*As defined in Table 13-1.

TABLE 13-3

Symptoms at the Index Contact of Headache Episodes

	N	Pct.
None recorded	43	9.0
Headache only	332	69.4
Other symptoms only	17	3.6
Headache and other symptoms	86	18.0
	478	100.0

TABLE 13-4

Status of Headache Diagnosis at the Index Contact, By Type of Initial Diagnosis

	Diagnosed Headache* 791.0, 791.1		Headache Symptom T151		Total N	Pct.
	N	Pct.	N	Pct.		
Unknown diagnosis	17	7.9	262	100.0	279	58.4
Tentative diagnosis	26	12.0	0	0.0	26	5.4
Established diagnosis	173	80.1	0	0.0	173	36.2
Total	216	100.0	262	100.0	478	100.0

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*Includes 5 episodes with intial diagnosis of 791.1, tension headache. This code was used only from September 30, 1966 to December 31, 1966; it was coded as 791.0, headache, afterward.

TABLE 13-5

Patient Age at Index Contact of Headache Episodes

Age	N	Pct.
0-12	53	11.1
13-18	46	9.6
19-24	68	14.2
25-34	118	24.7
35-44	67	14.0
45-54	61	12.8
55-64	40	8.4
65 or more	25	5.2
	478	100.0

Mean: 33.4 years
Standard Error: 0.8 years
Range: 2-81 years

TABLE 13-6

Duration of Headache Episodes

Duration	N	Pct.
Single day	303	63.4
2-7 days	22	4.6
8-30 days	26	5.4
31-90 days	32	6.7
91-180 days	16	3.3
181-364 days	17	3.6
1-1.99 years	23	4.8
2-2.99 years	17	3.6
3-3.99 years	11	2.3
4-4.99 years	5	1.0
5 or more years	6	1.3
	478	100.0

Mean duration: 149 days
SE: 17 days
Range: 1 day - 6.3 years

TABLE 13-7

Physician and Nonphysician Contacts During Episodes of Headache

Number of Contacts	Physician N	Physician Pct.	Nonphysician* N	Nonphysician* Pct.
0	18	3.8	447	93.5
1	285	59.6	21	4.4
2	77	16.1	4	0.8
3	39	8.2	1	0.2
4	21	4.4	2	0.4
5	16	3.3	--	--
6-10	16	3.3	2	0.4
11 or more	6	1.3	1	0.2
	478	100.0	478	100.0

	Physician	Nonphysician*
Mean	1.93	0.13
S.E.	0.09	0.04
Range	0-16	0-12
Percent of all contacts	93.7	6.3

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*Includes:
3 episodes with physical therapy contacts
3 episodes with mental health contacts
1 episode with social worker contacts
2 episodes with optometry contacts
22 episodes with other provider contacts, primarily with physician assistants

TABLE 13-8

Specialty of Provider at Index Contact of Headache Episodes

	N	Pct.
Internal Medicine	337	70.5
Pediatrics	66	13.8
Obstetrics/gynecology	20	4.2
Physician assistants	17	3.6
Ophthalmology and optometry	14	2.9
Surgery	11	2.3
Emergency care surgery	9	1.9
Orthopedics	2	0.4
Ear/nose/throat	2	0.4
	478	100.0

TABLE 13-9

Frequency of Provider Contacts by Specialty in Headache Episodes

	Percent of Episodes with Given Number of Contacts:						Maximum Number of Contacts Per Episode	Percent of all Contacts with the Provider Specialty
Specialty	0	1	2	3	4	5 or more		
Internist	25.3	44.8	12.1	6.9	3.8	7.1	15	76.0
Obstetrics	95.0	4.4	0.4	--	0.2	--	4	3.0
Ophthalmology	96.2	3.6	0.2	--	--	--	2	2.0
Orthopedics	99.4	0.2	0.2	--	--	0.2	7	1.0
Pediatrics	85.8	11.7	2.1	0.4	--	--	3	8.0
Surgery	97.1	2.5	0.2	0.2	--	--	3	2.0
Ear/nose/throat	99.0	0.6	0.2	0.2	--	--	3	1.0
Mental health	99.6	0.2	--	--	--	0.2	16	2.0
New health practitioners*	95.4	3.8	0.4	0.2	0.2	--	4	3.0
Emergency care surgery	97.3	2.5	0.2	--	--	--	2	1.0
Other specialties	99.4	0.2	0.2	--	--	0.2	5	1.0
								100.0

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*Primarily physician assistants.

TABLE 13-10

Combinations of Provider Specialties During Headache Episodes

	N	Pct.
Internist only	312	65.3
Pediatrician only	63	13.2
Surgeon or emergency care surgeon only	11	2.3
Other providers only	44	9.2
Internist and surgeon	11	2.3
Pediatrician and surgeon	3	0.6
Internist and pediatrician	2	0.4
Internist and other	30	6.3
Internist, surgeon, and other	2	0.4
	478	100.0

TABLE 13-11

Index Contact Instructions to Return for Further Care in Headache Episodes

	N	Pct.
No instruction to return for further care	323	67.6
Any return instruction	155	32.4
	478	100.0
Including:†		
Return to physician	85	17.8
Return to laboratory	38	7.9
Return to radiology	46	9.6
Other return instructions*	24	5.0

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*Includes 1 to physical therapy, 10 to optometry, and 13 to follow-up by a telephone call.

†These add to more than 155; patients may be asked to make multiple returns.

TABLE 13-12

Place and Type of Contacts for Headache Episodes

Number of Contacts	All Contacts		Episodes with Contacts at Medical Office		Episodes Including Regularly Scheduled Medical Office Contacts		Episodes Including Walk-In Medical Office Contacts		Episodes with Hospital Emergency Room Contacts		Episodes with Telephone or Letter Contacts*		Episodes with Other Outpatient Contacts	
	N	Pct.	N	Pct.	N	Pct.	N	Pct.	N	Pct.	N	Pct.	N	Pct.
0	0	0%	136	28.5%	306	64.1%	241	50.4%	418	87.4%	282	59.0%	475	99.4%
1	298	62.3	220	46.0	112	23.4	182	38.1	53	11.1	149	31.2	3	0.6
2	79	16.5	64	13.4	33	6.9	41	8.6	7	1.5	26	5.4	--	--
3	40	8.4	27	5.6	11	2.3	9	1.9	--	--	9	1.9	--	--
4	21	4.4	10	2.1	8	1.7	3	0.6	--	--	6	1.3	--	--
5	15	3.1	8	1.7	3	0.6	1	0.2	--	--	1	0.2	--	--
6-10	17	3.6	12	2.5	5	1.0	1	0.2	--	--	4	0.8	--	--
11 or more	8	1.7	1	0.2	--	--	--	--	--	--	1	0.2	--	--
	478	100.0	478	100.0	478	100.0	478	100.0	478	100.0	478	100.0	478	100.0
Mean	2.06		1.27		0.61		0.66		0.14		0.64		0.01	
S.E.	0.11		0.07		0.05		0.04		0.02		0.06		--	
Range	1-24		0-11		0-8		0-6		0-2		0-14		0-1	
Percent of total contacts, all episodes	100.0		62.0		30.0		32.0		7.0		31.0		--	

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*Four of the telephone or letter contacts were letters; all others were telephone calls.

TABLE 13-13

Type of Appointment at Index Contact for Headache Episodes

	N	Pct.
Regularly scheduled medical office visit	97	20.3
Walk-in medical office visit	202	42.3
Emergency room	45	9.4
Telephone or letter	134	28.0
	478	100.0

TABLE 13-15

Frequency of Routine Physical Examinations During Headache Episodes

Number	N	Pct.
0	405	84.7
1	54	11.3
2	13	2.7
3	5	1.0
4	1	0.2
	478	100.0

Mean: 0.20
S.E: 0.03
Range: 0-4

TABLE 13-16

Frequency of Office Visits in Headache Episodes, When Headache is the Principal Reason for the Contact

Number of Initial or Follow-up Office Visits*	N	Pct.
0	122	25.5
1	253	52.9
2	71	14.9
3	16	3.3
4	10	2.1
5 or more	6	1.3
	478	100.0

Mean: 1.08
S.E: 0.05
Range: 0-6

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*These visits could occur either in the medical office or in the hospital emergency room.

TABLE 13-14

Distribution of Headache Episode Contacts by Place of Service During the Episode

	Episodes with Medical Office Contacts		Includes Episodes with Regularly Scheduled Medical Office Contacts		Includes Episodes with Walk-In Medical Office Contacts		Episodes with Emergency Room Contacts		Episodes with Telephone or Letter Contacts	
Contacts	N	Pct.	N	Pct.	N	Pct.	N	Pct.	N	Pct.
None	136	28.5	306	64.0	241	50.4	418	87.4	282	59.0
Some	101	21.1	99	20.7	101	21.1	32	6.7	93	19.5
All	241	50.4	73	15.3	136	28.5	28	5.9	103*	21.5
	478	100.0	478	100.0	478	100.0	478	100.0	478	100.0

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*All episodes in this category consisted solely of telephone contacts.

TABLE 13-17

Frequency of Office Procedures for Headache Episodes

Procedure*	Proportion of Episodes with Given Number of Procedures: 0	1	2	3 or more	Maximum Number Per Episode	Cost
Eye office visits and procedures	96.9	1.7	1.3	0.2	3	$0-$15
Mental health visits	99.8	0.2	--	--	1	$25
Drug-related telephone calls	79.7	14.4	3.6	2.3	12	$1.50
Physical therapy	99.2	0.2	--	0.6	18	$5-$6
Parenteral treatment	97.1	2.5	0.2	0.2	4	$2.50-$4

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*Includes these procedures:

-Eye office visits and procedures: 9020, 9021, 5400, 5408, 5409: Initial and follow-up opthamologist visit; refraction of patient without glasses; visual fields; tonometry.

-Mental health visits: Initial and follow-up mental health office visits.

-Drug-related telephone calls: 9082, 9096, 9097: patient given prescription after a telephone call regarding symptoms; refill request; patient request for refill denied until patient visits physician.

-Physical therapy: 9461, 9462, 9473, 9489, 9492: short wave physical therapy; massage; active and passive exercise; neck collar; hot and cold packs.

-Parenteral treatment: 9388, 9397: single and multiple parenteral therapy.

TABLE 13-18

Frequency of Laboratory Tests in Headache Episodes*

Test	Percent of Episodes with Given Number of Procedures:				Maximum Number Per Episode	Cost per Test
	0	1	2	3		
Any laboratory test	88.5%	4.0%	1.9%	5.6%	9	Composite
Cultures	97.7	2.1	0.2	--	2	$3
Blood counts	93.7	3.1	1.3	1.9	3	$1.20-$3.60
Coagulation tests	98.8	0.8	--	0.4	4	$0.60-$4.50
Serum chemistry	97.5	1.3	0.4	0.8	5	$3-$4.50
Thyroid tests	99.8	0.2	--	--	1	$6
Electrocardiogram	99.6	0.4	--	--	1	$9
Urine tests	96.7	3.1	--	0.2	3	$1.50-$9
Disease screening	96.9	2.5	0.6	--	2	$1.80-$15
Electroencephalogram	98.3	1.7	--	--	1	$35

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*Procedure codes, 1964 CRVS, as adapted by the HSRC:

-Electroencephalogram: 9300.
-Cultures: 8483, throat culture; 8484, urine and blood culture.
-Blood counts: 8620, RBC; 8622, HGB; 8624, WBC; 8626, differential smear; 8708, platelet count; 8712, prothrombin time; 8751, partial thromboplastin time.
-Serum chemistry: 8641, calcium; 8650, chloride; 8652, cholesterol; 8707, phosphorus; 8709, potassium; 8721, sodium; 8722, glucose; 8745, BUN; 8747, uric acid; 8752, 8753, bilirubin; 8755, triglycerides; 8760, glucose cola.
-Iodine tests: 8758, T_4.
-Electrocardiogram: 9101.
-Urine tests: 8935, VMA; 8936, urinalysis; 8965, 24-hour urine electrolyte.
-Disease screening: 8606, ASO titer; 8685, heterophile; 8692, rheumatoid arthritis test; 8718, sedimentation rate.
-Electroencephalogram: 9330.

TABLE 13-19

Combinations of Laboratory Tests in Headache Episodes

	N	Pct.
No laboratory tests	423	88.5
Infection-related tests only*	18	3.8
Other laboratory tests only	15	3.1
Infection-related and other laboratory tests	22	4.6
	478	100.0

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*Denotes these procedures: WBC, differential smear, CBC, HCT, throat culture, urine and blood culture, ASO titer, heterophile.

TABLE 13-20

Frequency of Radiology Procedures in Headache Episodes*

Test	Percent of Episodes with Given Number of Tests:			Maximum Number of Tests Per Episode	Cost
	0	1	2 or more		
All radiology	86.4%	10.7%	2.9%	3	Composite
Skull x-rays	92.7	7.3	--	1	$9-$15
Cervical spine x-rays	95.4	4.6	--	1	$9-$11.50
Nasal, paranasal x-rays	96.9	3.1	--	1	$7.50-$12
Other head, neck	99.6	0.4	--	1	$7.50-$36
All head, neck scans/x-rays	88.6	11.3	2.1	2	Composite
Chest x-rays	99.4	0.6	--	1	$6
Low, mid-spine x-rays	99.6	0.2	0.2	2	$9-$11.50

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*Procedure codes, 1964 CRVS, as adapted by the HSRC:

-Skull x-rays: 7025, skull, less than 4 views; 7026, skull, 4 or more views.
-Cervical spine x-rays: 7203, cervical spine, 3 views; 7204, cervical spine-A/P and lateral.
-Nasal/paranasal x-rays: 7021, paranasal sinuses, less than 3 views; 7022, paranasal sinuses, 3 or more views.
-Other head/neck scans, x-rays: 7024, sella turcica; 7855, brain scan.
-Chest x-ray, single view: 7100.
-Low/mid-spine x-rays: 7207, thoracic or dorsal spine, 2 views; 7232, lumbo-sacral spine, 3 views.

TABLE 13-21

Frequency of Drug Orders in Headache Episodes*

Type of Drug Ordered	Percent of Episodes Receiving the Given Number of Drug Orders: 0	1	2	3 or more	Maximum Number Of Drug Orders Per Episode
All drugs	35.8%	41.6%	13.2%	9.4%	11
Narcotic analgesics	83.7	13.2	2.1	1.0	7
Non-narcotic analgesics	66.3	31.1	1.1	1.5	5
Migraine ameliorators	98.9	1.1	--	--	1
Antihistamine-decongestant	95.8	4.2	--	--	1
Antivertigo/antinausea	99.5	0.5	--	--	1
Sedatives/minor tranquilizers	77.4	18.4	3.2	1.0	4
Antidepressants	99.5	0.5	--	--	1
Major tranquilizers	97.3	1.6	1.1	--	2
All psychoactive drugs**	74.7	20.0	3.7	1.6	4
Antispasmodics	98.4	1.6	--	--	1
Steroids	99.5	0.5	--	--	1

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*Based on 1980 episodes beginning in 1972-1973, the only years for which drug order information was available.

**Denotes sedatives, minor tranquilizers, major tranquilizers, skeletal muscle relaxants, and antidepressants.

TABLE 13-22

Combinations of Drug Orders in Headache Episodes*

	N	Pct.
No drug orders	68	35.8
Psychoactive† drug orders only	22	11.6
Psychoactive and other drug orders	26	13.7
Other drug orders only	74	38.9
	190	100.0

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*Based on 190 episodes beginning in 1972 or 1973, the only years in which drug order data were available.

†Denotes orders for sedatives or minor tranquilizers or major tranquilizers or skeletal muscle relaxants or antidepressants.

TABLE 13-23

Costs of Care for Headache Episodes

	Total Costs		Laboratory Costs		X-ray Costs		Letter Costs		Telephone Costs		Office Visit Costs		Other Office Procedure Costs	
Dollars	N	Pct.	N	Pct.	N	Pct.	N	Pct.	N	Pct.	N	Pct.	N	Pct.
0	1	0.2%	429	89.7%	413	86.4%	475	99.4%	291	60.9%	121	25.3%	440	92.1%
1-10	291	60.9	42	8.8	21	4.4	3	0.6	183	38.3	255	53.3	12	2.5
11-20	95	19.9	6	1.2	33	6.9	--	--	4	0.8	81	16.9	15	3.1
21-30	46	9.6	0	--	10	2.1	--	--	--	--	13	2.7	2	0.4
31-40	16	3.3	1	0.2	--	--	--	--	--	--	6	1.3	6	1.3
41-50	14	2.9	--	--	--	--	--	--	--	--	1	0.2	1	0.2
50 or more	15	3.1	--	--	1	0.2	--	--	--	--	1	0.2	2	0.4
	478	100.0	478	100.0	478	100.0	478	100.0	478	100.0	478	100.0	478	100.0
Mean	$14.97		$0.71		$2.07		$0.02		$0.88		$9.68		$1.61	
S.E.	$ 0.80		$0.12		$0.27		$0.01		$0.08		$0.46		$0.37	
Range	$0-$184.50		$0-$31.50		$0-$57		$0-$3.50		$0-$19.50		$0-$165		$0-$95	
Percent of total dollar costs	100.0		4.7		13.8		0.1		5.9		64.7		10.8	

TABLE 13-24

Age at Index Contact in Episodes of Nonspecific Headache and or Migraine

		0-18	19-44	45+	
Nonspecific headache	N	99	253	126	478
	Pct.	20.7	52.9	26.4	100.0
Migraine	N	9	39	6	54
	Pct.	16.7	72.2	11.1	100.0

TABLE 13-25

Proportion of Migraine and Nonspecific Headache Episodes with Symptoms at Index Contact†

	Nonspecific Headache N=478	Migraine N=54
	Pct.	Pct.
No symptoms	9.0	27.7
Headache symptoms	87.4	59.2
Migraine symptoms*	4.2	25.9
Other symptoms	17.4	18.5

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*Defined as adapted ICDA codes T225, diminished vision; T248, spots in field of vision; T458, nausea; T459, vomiting; T460, nausea and vomiting, as either the primary or secondary symptom. In over 86 percent of migraine and nonspecific headache episodes, the migraine symptoms appeared with a coded headache symptom. Episodes with photophobia were excluded because that symptom could be due to serious neurologic disease as well as to migraine.

†These proportions add up to over 100 percent, since an episode could have multiple symptoms.

TABLE 13-26

Provider Specialty at Index Contact for Episodes of Migraine and Nonspecific Headache

	Nonspecific Headache		Migraine	
	N	Pct.	N	Pct.
Internist	337	70.5	28	51.9
Ophthalmology/optometry	14	2.9	10	18.5
Pediatrician	66	13.8	7	13.0
Surgeon, emergency care surgeon	20	4.2	4	7.4
Ob-gyn	20	4.2	2	3.7
Other*	21	4.4	3	5.5
	478	100.0	54	100.0

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*Orthopedist, ENT, new health practitioner.

TABLE 13-27

Proportion of Migraine and Nonspecific Headache Episodes with Selected Types of Provider Contacts

	Nonspecific Headache N=478	Migraine N=54
	Pct.	Pct.
One or more ophthalmologist contacts	3.8	24.1
One or more emergency care surgery contacts	2.7	9.3
One or more consultant contacts	2.7	11.1

TABLE 13-28

Distribution of Duration in Days of Migraine and Nonspecific Headache Episodes

		1 Day	2-30 Days	31-364 Days	1+ Years	N	Mean	S.E.	F	P
Nonspecific headache	N	303	48	65	62	478	149 days	17 days	17.2	<.0001
	Pct.	63.4	10.0	13.6	13.0	100.0				
Migraine	N	19	9	9	17	54	389 days	81 days		
	Pct.	35.2	16.7	16.7	31.5	100.0				

TABLE 13-29

Selected Types of Contacts in Episodes of Migraine and of Nonspecific Headache

Type of Contact		Percent of Episodes with Given Number of Contacts: 0	1	2	3+	Mean per Episode	S.E.	F	P
All medical office contacts	Nonspecific headache	28.5%	46.0%	13.4%	12.1%	1.3	0.1	13.4	.0003
	Migraine	7.4	50.0	14.0	27.8	2.1	0.3		
All telephone/ letter contacts	Nonspecific headache	59.0	31.2	9.8	Included in "2"	0.6	0.1	5.0	.03
	Migraine	57.4	22.2	20.4		1.1	0.3		
All medical contacts with headache or migraine as the presenting morbidity	Nonspecific headache	25.5	52.9	14.9	6.7	1.1	0.1	14.8	<.0001
	Migraine	20.4	42.5	16.7	20.4	1.7	0.3		
		Percent of Episodes with Given Number of Contacts: 1	**2**	**3**	**4+**				
All contacts	Nonspecific headache	62.3%	16.5%	8.4%	12.8%	2.1	0.1	19.9	<.0001
	Migraine	33.3	22.2	9.3	35.2	3.7	0.6		

TABLE 13-30

Percent of Migraine and Nonspecific Headache Episodes with Selected Utilization Measures in at Least one Contact

	Nonspecific Headache N=478	Migraine N=54
	Pct.	Pct.
Hospitalization	0%	3.7%
Emergency room visit	12.6	27.8
Eye-related visits and procedures	3.1	22.2
Parenteral therapy	2.9	20.4
Narcotic analgesics*	16.3	33.3
Non-narcotic analgesics*	33.7	7.4
Migraine ameliorators*	1.1	14.8
Antivertigo/antinausea drugs*	0.5	11.1

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*Based on 190 nonspecific headache episodes and 27 migraine episodes which began in 1972-1973.

TABLE 13-31

Mean Cost of Nonspecific Headache and Migraine Episodes

		Laboratory	Radiology	Letter	Telephone	Office Visit	Office Procedure	All Costs
Nonspecific headache	Mean	$0.71	$2.07	$0.02	$0.88	$ 9.68	$7.61	$14.97
	S.E.	$0.12	$0.27	$0.01	$0.08	$ 0.46	$0.37	$ 0.80
Migraine	Mean	$1.06	$1.36	$0.05	$1.44	$13.01	$5.34	$22.26
	S.E.	$0.46	$0.56	$0.05	$0.40	$ 1.69	$1.42	$ 3.08
	F	0.8	0.8	0.8	4.3	5.0	9.8	8.0
	P	.39	.38	.38	.04	.03	.002	.005

TABLE 13-32

Mean Cost per Headache Episode, by the Presence or Absence of Selected Comorbidities

	Comorbidity*	Mean Cost Per Episode	S.E.	N	F	P	Eta^2
1.	No allergy	$14.80	$0.80	470	4.0	.05	.01
	Allergy	$27.10	$9.20	8			
2.	No menstrual, menopausal condition	$14.90	$0.80	465	0.3	.60	0
	Menstrual, menopausal condition	$17.50	$4.20	13			
3.	No hypertension	$14.70	$0.80	449	2.4	.12	.01
	Hypertension	$19.80	$3.20	29			
4.	No severe or life-threatening comorbidities	$15.00	$0.80	460	0.1	.93	0
	Severe comorbidity present in at least one contact	$14.60	$1.12	18			
5.	No psychiatric symptoms or comorbidities	$13.30	$0.70	422	34.9	<.0001	.07
	Psychiatric symptoms or comorbidities	$27.40	$4.10	56			
6.	No head or neck infection symptoms or comorbidities	$14.70	$0.90	402	0.6	.47	0
	Head/neck infection symptoms or comorbidities	$16.30	$1.80	76			
7.	No noninfection-related head/neck comorbidities	$14.00	$0.80	420	10.9	.001	.02
	Noninfection-related head/neck comorbidity	$22.00	$3.10	58			
8.	No comorbidities other than those in groups 4, 5, 6, and 7	$11.70	$0.60	347	47.8	<.0001	.09
	Comorbidities other than those in groups 4, 5, 6, and 7	$23.50	$2.20	131			
9.	No comorbidities at all	$10.90	$0.70	242	28.9	<.0001	.06
	Any comorbidities present	$19.20	1.40	236			

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*As defined in Table 11-1.

TABLE 13-33

Mean Cost per Headache Episode By Comorbidities in the Episode*

	Mean	S.E.	N	F	P	Eta^2
Psychiatric comorbidities or symptoms	$27.40	$4.10	56			
Other disease comorbidities without psychiatric comorbidities	$16.60	$1.30	180	24.0	<.0001	.09
No disease comorbidities	$10.90	$0.70	242			

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*As defined in Table 13-2.

TABLE 13-34

Mean Cost per Headache Episode,
By Whether Headache was the Presenting Morbidity at all Episode Contacts

	Mean	S.E.	N	F	P	Eta^2
Headache not always presenting morbidity	$26.00	$3.30	79	41.2	<.0001	.08
Headache presenting morbidity, all contacts	$12.80	$0.70	399			

TABLE 13-35

Mean Dollar Cost per Headache Episode, by Status of Diagnosis at the Index Contact

	Mean	S.E.	N	F	P	Eta^2
Diagnosis unknown	$12.40	$0.90	279			
Diagnosis tentative	$20.10	$6.00	26	7.6	.0006	.03
Diagnosis established	$18.30	$1.40	173			

TABLE 13-36

Mean Cost per Headache Episode, by Symptom or Disease Diagnosis at Index Contact

	Mean	S.E.	N	F	P	Eta^2
Headache symptom - T151*	$11.10	$0.70	262	30.9	<.0001	.07
Headache diagnosis - 791.0, 791.1**	$19.70	$1.50	216			

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*Always an "unknown" diagnosis at the index contact.
**Usually a "tentative" or "established" diagnosis at the index contact.

TABLE 13-37

Mean Cost per Headache Episode, by Patient Age at Index Contact

Age	Mean	S.E.	N	F	P	Eta^2
0-18	$12.40	$1.20	99			
19-34	$14.60	$1.10	186	3.4	.02	.02
35-54	$18.80	$2.20	128			
55 or more	$12.20	$1.20	65			

TABLE 13-38

Mean Cost per Headache Episodes, by Episode Duration

	Mean	S.E.	N	F	P	Eta^2
1 day	$ 9.10	$0.40	303			
2 - 30 days	$16.90	$1.60	48	55.7	<.0001	.26
31- 364 days	$22.60	$2.10	65			
1 or more years	$34.30	$4.20	62			

TABLE 13-39

Mean Cost per Headache Episode, by the Specialty of the Provider at the Index Contact

	Mean	S.E.	N	Γ	P	Eta^2
Internal medicine	$15.80	$1.00	337	2.2	.03	.04
Obstetrician	$ 4.50	$1.10	20			
Ophthalmology	$18.30	$3.70	14			
Orthopedics	$10.50	$9.00	2			
Pediatricians	$11.10	$1.10	66			
Surgeons	$26.60	$6.80	11			
Ear/nose/throat	$10.00	0	2			
Physician assistants	$14.50	$1.50	17			
Emergency care surgeons	$18.00	$5.00	9			

TABLE 13-40

Mean Cost of Headache Episodes, by the Presence or Absence of Obstetrician Contacts in the Episode

	Mean	S.E.	N	F	P	Eta^2
No obstetrician	$15.50	$ 0.80	454	7.4	.007	.02
Obstetrician	$ 5.60	$ 1.10	24			

TABLE 13-41

Mean Cost of Multiple-Contact Headache Episodes, by the Presence or Absence of Selected Provider Specialty Contacts in the Episode

	Mean	S.E.	N	F	P	Eta^2
No physical therapy contacts	$23.83	$ 1.61	177	36.3	<.0001	.17
One or more physical therapy contacts	$99.90	$19.46	3			
No mental health or social work contacts	$23.94	$ 1.53	176	20.9	<.0001	.11
Mental health or social work contacts	$76.00	$38.13	4			
No orthopedist contacts	$24.67	$ 1.72	178	5.4	.02	.03
Orthopedist contacts	$63.25	$43.74	2			

TABLE 13-42

Mean Cost of Multiple-Contact Headache Episodes, by Presence or Absence of a Consultant Contact

	Mean	S.E.	N	F	P	Eta^2
No consultant	$22.60	$ 1.75	167	29.8	<.0001	.14
Consultant	$57.20	$12.83	13			

TABLE 13-45

Mean Cost of Headache Episodes, by the Place of Service and Type of Appointment at the Index Contact

	Mean	S.E.	N	F	P	Eta^2
Regularly scheduled medical office visit	\$20.50	\$1.80	97			
Walk-in medical office visit	\$17.40	\$1.10	202	16.4	<.0001	.09
Hospital emergency room	\$16.50	\$1.80	45			
Telephone or letter	\$ 6.70	\$1.50	134			

TABLE 13-46

Mean Cost per Headache Episode, by the Laboratory Procedures in the Episode*

	Mean	S.E.	N	F	P	Eta^2
No laboratory procedures	\$12.20	\$0.70	423			
Infection-related laboratory tests only	\$26.50	\$4.90	15	48.9	<.0001	.23
Other laboratory tests only	\$50.90	\$7.60	18			
Infection-related and other laboratory tests	\$31.10	\$4.10	22			

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*As defined in Table 13-19.

TABLE 13-43

Mean Cost per Headache Episode, by Time of Index Contact

	Mean	S.E.	N	F	P	Eta^2
Index contact outside regular medical office hours	\$11.40	\$1.60	77	4.0	.05	.01
Index contact within regular medical office hours	\$15.70	\$0.90	401			

TABLE 13-44

Mean Cost per Headache Episode, by the Presence or Absence of Index Contact Instructions to Return for Further Care

	Mean	S.E.	N	F	P	Eta^2
No return to physician	\$13.80	\$ 0.90	393	11.1	.001	.02
Return to physician ordered	\$20.60	\$ 1.90	85			
No return to laboratory	\$14.00	\$ 0.80	440	19.3	<.0001	.04
Return to laboratory ordered	\$26.60	\$ 2.90	38			
No return to radiology	\$12.70	\$ 0.80	432	86.6	<.0001	.15
Return to radiology ordered	\$35.90	\$ 2.80	46			
No other returns ordered	\$15.00	\$ 0.80	454	.03	.86	0
Other returns ordered	\$14.40	\$ 2.40	24			
No return ordered	\$11.50	\$ 0.90	323	44.5	<.0001	.09
Any return ordered	\$22.30	\$ 1.40	155			

TABLE 13-47

Mean Cost per Headache Episode, by the Types of Drug Orders*

	Mean	S.E.	N	F	P	Eta^2
No narcotic analgesics	$13.10	$ 0.80	159	2.9	.09	.01
Narcotic analgesics	$16.90	$ 2.70	31			
No non-narcotic analgesics	$13.60	$ 1.10	126	0.04	.84	0
Non-narcotic analgesics	$14.00	$ 1.20	64			
No sedatives, minor tranquilizers	$12.40	$ 0.90	147	9.9	.002	.05
Sedatives, minor tranquilizers	$18.40	$ 1.90	43			
No psychoactive drugs	$11.80	$ 0.90	142	16.8	.0001	.08
Psychoactive drugs**	$19.30	$ 1.80	48			
No other drug orders	$13.60	$ 0.80	172	0.5	.50	0
Other drug orders***	$15.50	$ 3.40	18			

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* Data are for 190 episodes beginning in 1972-1973, the only years for which drug data were available.

** Includes sedatives, minor tranquilizers, major tranquilizers, skeletal muscle relaxants, and antidepressants.

***Includes all drug orders except for analgesics or psychoactive drugs.

TABLE 13-48

Mean Cost per Headache Episode, by Combinations of Drugs Ordered During the Episode*

	Mean	S.E.	N	F	P	Eta^2
No drug orders	$11.80	$1.30	68			
Psychoactive drug orders only	$19.50	$3.00	22	5.5	.001	.08
Nonpsychoactive drug orders only	$11.90	$1.20	74			
Psychoactive and nonpsyschoactive drug orders	$19.20	$2.20	26			

TABLE 13-49

Extent of Relationships Between Mean Costs per Headache Episode and Selected Utilization Measures

Procedure	F	P	Eta2
All medical office contacts	68.1	<.0001	.62
All emergency room contacts	11.8	<.0001	.05
All telephone or letter contacts	31.7	<.0001	.35
All other contacts	4.8	.03	.01
All contacts	66.5	<.0001	.68
All physician contacts	37.0	<.0001	.53
All nonphysician contacts	47.4	<.0001	.37
Initial and follow-up office visits for headache as the presenting morbidity	70.3	<.0001	.47
Physical examinations	9.9	<.0001	.08
Eye-related office visits and procedures	3.1	.03	.02
Drug-related telephone calls	24.2	<.0001	.29
Physical therapy procedures	25.1	<.0001	.18
Parenteral therapy	12.2	<.0001	.07
Skull x-rays	151.5	<.0001	.24
Cervical spine x-rays	29.6	<.0001	.06
Nasal or paranasal x-rays	23.9	<.0001	.05
Other head or neck scans or x-rays	6.9	.001	.01
Electroencephalograms	158.3	<.0001	.25
Any EEG or head/neck scan or x-ray	169.8	<.0001	.42
All other x-rays (includes chest or lower or mid-spine)	12.9	<.0001	.05
All x-rays	72.0	<.0001	.31
All drug orders	5.0	<.0001	.16
Infection-related laboratory tests	7.4	<.0001	.06
All other laboratory tests	21.1	<.0001	.21
All laboratory tests	18.7	<.0001	.22

TABLE 13-50

Variables Included in Utilization AID Analysis for Episodes of Nonspecific Headache

1. Number of drug-related telephone calls (0, 1, 2+)
2. Were all contacts telephone calls? (Yes/no)
3. Were there any emergency room contacts?. (Yes/no)
4. Number of initial and follow-up office visits at which headache was the presenting morbidity (0, 1, 2, 3, 4+)
5. Number of physical examinations (0, 1, 2+)
6. Were there any eye-related office visits or procedures? (Yes/no)
7. Were there any head or neck x-rays, EEGs, or scans? (Yes/no)
8. Number of laboratory tests, except EEGs (0, 1, 2, 3+)
9. Number of infection-related laboratory tests (0, 1, 2, 3+)
10. Number of laboratory tests except EEGs or infection-related tests (0, 1, 2+)
11. Were there any contacts within regular medical office hours? (Yes/no)
12. Were there any regularly scheduled medical office appointments? (Yes/no)
13. Were there any walk-in medical office visits? (Yes/no)
14. Type of index contact (regularly scheduled medical office, walk-in medical office, hospital emergency room, telephone or letter)

TABLE 13-51

Composition of Bundles of Care for Headache Episodes

Bundle	Number of Episodes		All Medical Office Contacts		All Telephone and Letter Contacts		All Drug Orders		Radiology and EEG		Laboratory Tests, Except EEG		Mean Duration In Days		Mean Cost	
	All	1972-1973*	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.
1. All telephone contacts	103	37	0	0	1.17	.06	.59	.10	0	0	0	0	32	14	$1.26	$0.09
2. 0-1 OVs, no laboratory tests	220	89	1.0	.04	.20	.04	.82	.08	0	0	0	0	62	16	$10.15	$0.18
3. 0-1 OVs, 1+ laboratory tests	22	13	1.0	.11	.27	.12	.62	.24	0	0	2.60	.32	74	54	$16.41	$0.67
4. 2+ OVs, no drug telephone calls	49	17	2.61	.18	.37	.10	2.0	.42	0.04	.04	.41	.16	435	82	$21.41	$1.18
5. 1+ head/neck x-rays/scans/EEGs; 1 OV, no drug telephone calls	24	15	1.21	.10	.13	.07	.73	.18	1.17	.08	.38	.22	17	10	$28.67	$1.70
6. 2+ OVs, 1+ drug-related telephone calls	16	4	3.88	.72	3.69	.91	5.25	1.93	0	0	.50	.34	822	202	$36.44	$10.17
7. 1+ head/neck x-rays/scans/EEGs, 2+ OVs.	28	11	2.71	.31	.32	.10	1.82	.42	1.29	.09	.89	.29	336	94	$40.29	$3.14
8. 1+ head/neck x-rays/scans/EEGs; 1+ drug telephone calls	16	4	4.5	.75	2.87	.61	3.0	.41	1.38	.16	1.38	.67	531	80	$57.69	$8.56
	F		82.8		49.1		16.6		333.9		34.7		24.9			
	P		<.0001		<.0001		<.0001		<.0001		<.0001		<.0001			

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pplies to drug order data only.

TABLE 13-52

Frequency of Bundles of Care in Migraine and Nonspecific Headache Episodes

	Nonspecific Headache		Migraine	
	N	Pct.	N	Pct.
All contacts by telephone	103	21.5%	0	0%
0-1 office visit with headache or migraine as the presenting morbidity	242	50.7	33	61.2
2 or more office visits with headache or migraine as the presenting morbidity	65	13.6	16	29.6
1 or more head or neck scans, x-rays or EEGs	68	14.2	5	9.2
	478	100.0%	54	100.0%

TABLE 13-53

Variables Included in Patient, Provider, and Medical Care Process AID Analysis of Nonspecific Headache Episodes

1. Sex (male, female)
2. Patient age at index contact (0-18, 19-34, 35-54, 55+)
3. Symptoms at index contact (none, headache only, other symptoms only, headache with other symptoms)
4. Status of index contact diagnosis (tentative, unknown, established)
5. Were there any physician contacts in the episode? (Yes/no)
6. Were there any nonphysician contacts in the episode? (Yes/no)
7. Specialty of index contact provider (internist, ob-gyn, orthopedics, pediatrics, surgery, emergency care surgery, ear/nose/throat, physician assistant)
8. Were there any internist contacts in the episode? (Yes/no)
9. Were there any Ob-Gyn contracts in the episode? (Yes/no)
10. Were there any ophthalmologist contacts in the episode? (Yes/no)
11. Were there any pediatrician contacts in the episode? (Yes/no)
12. Were there any new health practitioner contacts in the episode? (Yes/no)
13. Were there any surgeon or emergency care surgeon contacts in the episode? (Yes/no)
14. Was the index contact in regular medical office hours? (Yes/no)
15. Physician status at the index contact (regular attending, temporary attending)
16. Year of index contact (1966-1967, 1968, 1969, 1970, 1971, 1972, 1973)
17. Comorbidities in the episode (psychiatric comorbidities or symptoms, other disease comorbidities, no disease comorbidities)

Duration of the episode, which alone explained 26 percent of variation in episode cost, was omitted from all AID analyses.

TABLE 13-54

Bundles of Care for Headache Episodes as Identified by AID Analysis and Used in Log-linear Modeling

	N	Mean Dollars	S.D.
1. All contacts by telephone	103	$ 1.26	$ 0.89
2. 0-1 office visit for headache as the presenting morbidity (OV) without laboratory tests	220	10.15	2.71
3. 0-1 OV, with 1 or more laboratory tests (excluding EEGs)	22	16.41	3.17
4. 2 or more OVs, without a drug-related telephone call	49	21.41	8.32
5. 1 OV, without a drug-related telephone call, with a head or neck x-ray, scan, or EEG	24	28.07	8.33
6. 2 or more OVs, with a drug-related telephone call	16	36.44	40.69
7. 1 or more head or neck x-rays or scans or EEGs, without drug-related telephone calls and with 2 or more OVs	28	40.29	16.62
8. 1 or more head or neck x-rays or scans or EEGs, with 1 or more drug-related telephone calls	16	57.69	34.23
	478	$14.85*	$17.45

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*This mean cost is different from overall mean costs cited elsewhere in this report due to rounding and truncation of cost data for AID analysis.

TABLE 13-55

Patient, Provider, and Medical Care Process Variables Included in Log-Linear Analysis of Headache Episodes

1. Were there any nonphysician contacts in the episode? (Yes/no)
2. Were comorbidities present in the episode? (Yes/no)
3. Diagnosis status at the index contact (unknown, tentative/established)
4. Provider specialty at the index contact (internist/ob-gyn, pediatrician, NHP, surgeon/emergency care surgeon/ENT/orthopedics)
5. Symptoms present at the index contact (none, headache only, other symptoms with or without headache)

TABLE 56

Nonspecific Headache Episodes: Log-Linear Parameters
Divided by their Standard Errors, and Beta Values
for Relationships Between Bundle of Care and
Patient/Provider/Medical Care Process Variables with $P \leq 0.05$

Bundle of Care	Any Nonphysician Contacts In Episode		Any Comorbidities In Episode		Diagnosis Status at Index Contact	
	No	Yes	Yes	No	Unknown	Tentative/Established
1. All telephone contacts	2.915* 1.446	-2.915* 0.691	-2.710* 0.710	2.710* 1.409	3.882* 1.635	-3.882** 0.612
2. 0-1 office visit, no laboratory tests	4.526** 1.697	-4.526** 0.589				
3. 0-1 office visit with 1+ laboratory test						
4. 2+ office visits without any drug-related telephone calls			2.187 1.322	-2.187 0.756		
5. Head or neck x-ray/scan/EEG; 1 office visit, no drug-related telephone calls						
6. 2+ office visits with 1+ drug-related telephone calls						
7. Head or neck x-ray/scan/EEG, with 2+ office visits and without drug-related telephone calls						
8. Head or neck x-ray/scan/EEG, with one or more drug-related telephone calls	-2.714* 0.704	2.714* 1.421				

---

* $p \leq .01$

**$p \leq .001$

TABLE 13-57

Log-Linear Parameters Divided by their Standard Errors, and (Beta Values) for Relationships Among Nonspecific Headache Episode Patient, Provider and Medical Care Process Variables with $P \leq 0.05$

	Is There a Nonphysician Contact in the Episode?		Diagnosis Status at Index Contact		Symptoms at Index Contact		
Provider Specialty at Index Contact	No	Yes	Unknown	Tentative, Established	None	Headache Only	Others Present
Internist or Obstetrician	6.928**	-6.928**			-2.111	3.664**	
	1.719	0.582			0.786	1.476	
Pediatrician			2.482	-2.482			
			1.232	0.811			
Surgeon, ENT, Orthopedist, or Emergency Care Surgeon							
NHP	-5.708**	5.708**					
	0.615	1.627					

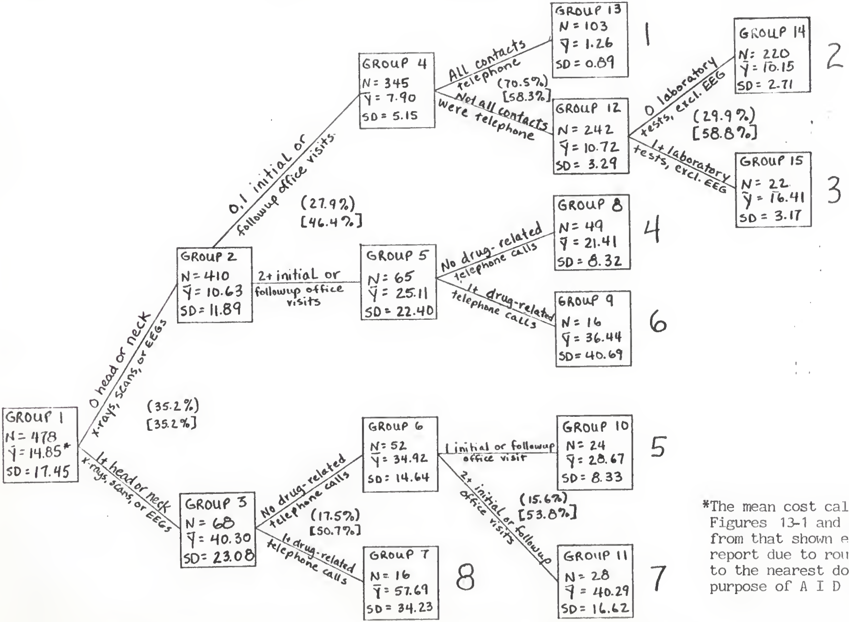
	Any Nonphysician Contact in the Episode?		Comorbidities Present in the Episode		Diagnosis Status At Index Contact	
Symptoms at the Index Contact	No	Yes	No	Yes	Unknown	Tentative, Established
None	-2.981*	2.981*			-3.877**	3.887**
	0.814	1.228			0.766	1.306
Headache only	2.794*	-2.794*	-2.111	2.111	2.604*	-2.604*
	1.203	0.831	0.869	1.150	1.188	0.842
Other symptoms with or without headache			3.317*	-3.317*		
			1.253	0.798		

---

*$p \leq 0.01$
**$p \leq 0.001$

FIGURE 13-1

A I D analysis for 478 episodes of nonspecific headache; individual all-episode utilization measures are used to predict total episode dollar cost. Boxes contain number of episodes (N), mean dollars per episode ($\bar{y}$), and standard deviation (S.D.) for episodes in each group. Parentheses contain percent group cost explained by each split. Brackets contain cumulative proportion of variation in cost for entire population explained by all prior splits. Large numbers indicate terminations of bundle pathways in order of increasing mean dollar costs.


GROUP 1 N = 478 ȳ = 14.85* SD = 17.45
0 head or neck x-rays, scans, or EEGs
(35.2%) [35.2%]
1+ head or neck x-rays, scans, or EEGs
GROUP 2 N = 410 ȳ = 10.63 SD = 11.89
0,1 initial or followup office visits
(27.9%) [46.4%]
2+ initial or followup office visits
GROUP 3 N = 68 ȳ = 40.30 SD = 23.08
No drug-related telephone calls
(17.5%) [50.7%]
1+ drug-related telephone calls
GROUP 4 N = 345 ȳ = 7.90 SD = 5.15
All contacts telephone
(70.5%) [58.3%]
Not all contacts were telephone
GROUP 5 N = 65 ȳ = 25.11 SD = 22.40
No drug-related telephone calls
1+ drug-related telephone calls
GROUP 6 N = 52 ȳ = 34.92 SD = 14.64
1 initial or followup office visit
2+ initial or followup office visits
(15.6%) [53.8%]
GROUP 7 N = 16 ȳ = 57.69 SD = 34.23
8
GROUP 8 N = 49 ȳ = 21.41 SD = 8.32
4
GROUP 9 N = 16 ȳ = 36.44 SD = 40.69
6
GROUP 10 N = 24 ȳ = 28.67 SD = 8.33
5
GROUP 11 N = 28 ȳ = 40.29 SD = 16.62
7
GROUP 12 N = 242 ȳ = 10.72 SD = 3.29
0 laboratory tests, excl. EEG
(29.9%) [58.8%]
1+ laboratory tests, excl. EEG
GROUP 13 N = 103 ȳ = 1.26 SD = 0.89
1
GROUP 14 N = 220 ȳ = 10.15 SD = 2.71
2
GROUP 15 N = 22 ȳ = 16.41 SD = 3.17
3

*The mean cost calculated in Figures 13-1 and 13-2 differ from that shown earlier in the report due to rounding of costs to the nearest dollar for the purpose of A I D analysis.

FIGURE 13-2

A I D analysis for 478 episodes of nonspecific headache, using patient, provider, and medical care process characteristics to predict total episode dollar costs.

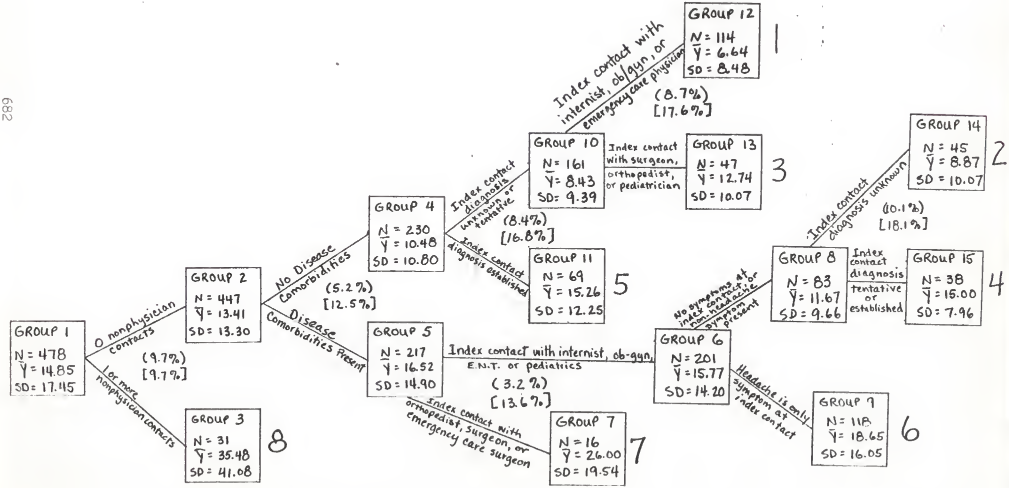
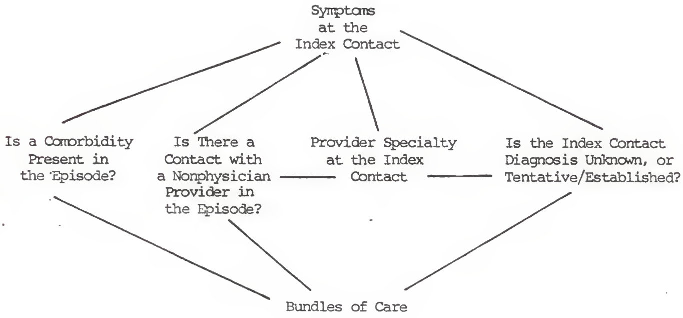


FIGURE 13-3

Two-Way Interrelationships ($P \leq .05$) Among Patient/Provider/Medical Care Process Variables and Bundles of Care for Headache Episodes, As defined by Log-Linear Multiway Contingency Analysis


Symptoms at the Index Contact
Is a Comorbidity Present in the Episode?
Is There a Contact with a Nonphysician Provider in the Episode?
Provider Specialty at the Index Contact
Is the Index Contact Diagnosis Unknown, or Tentative/Established?
Bundles of Care

SECTION XIV. BREAST LUMP

John P. Mullooly and Jane C. Record

ABSTRACT

Episodes of breast lump consisted of contacts for care of a benign neoplasm of the breast, of an unspecified neoplasm of the breast or for the symptoms of breast swelling or mass. The duration of the episode was the time from the first contact for care during the study period to the last recorded contact for care or the last recorded contact before the diagnosis was updated to cancer, chronic cystic breast disease, or other breast disease.

One hundred eighty-one episodes of breast lump were identified. For two-thirds of the episodes, the diagnosis of breast lump was not revised; 19.3 percent were updated to chronic, cystic disease, and 7.2 percent to cancer. The mean and median durations of episode were 29 days and five days, respectively, with the range from one contact to 402 days. One-half of the episodes consisted of a single contact for care.

The mean and median numbers of contacts for care per episode were 2.3 and 1.5, respectively, with a maximum of 14 contacts. The mean and median costs per episode were $36 and $17, respectively, with the range from no cost to $310 per episode. Sixteen percent of the episodes had no costs assigned to them.

Four bundles of care that accounted for 67 percent of the variation in total cost of the episode were identified. Twenty-four of the 181 episodes (13.3 percent) involved a biopsy and had an average cost of $125.51 (SE=$9.17), accounting for 46.5 percent of the total cost. Episodes without a biopsy but with three or more contacts (36/181=19.9 percent) had an average cost of $49.61 (SE=$6.50), accounting for 27.6 percent of the total cost. Episodes involving a surgeon but not a biopsy and having two or fewer contacts (58/181=32.0 percent) had an average cost of $21.81 (SE=$2.88), accounting for 19.5 percent of the total cost. Finally, 63 episodes (34.8 percent) that had neither a surgeon nor a biopsy and had two or fewer contacts. The cost of these episodes averaged $6.59 (SE-$1.01), accounting for 6.4 percent of the total cost.

When the first contact in the episode was with an internist, the mammography rate was high (42.4 percent) and the biopsy rate low (4.5 percent), whereas when the first contact was with an obstetrician/gynecologist or surgeon, the mammography rate was low (20.8 percent) and the biopsy rate high (18.9 percent).

Episodes that ended with a diagnosis of breast cancer had a higher average cost, $93.33 (SE=$23.24), than those with other updated morbidities. Episodes updated to breast mass/swelling had the lowest average cost, $20.87 (SE=$3.54).

The diagnoses and symptoms used to define episodes of diagnostic care for breast lump did not appear to produce a homogeneous or clinically equivalent group of episodes. The average laboratory/radiology costs were significantly lower for benign neoplasm than for unspecified neoplasm or breast swelling/mass. Episodes with an index diagnosis of benign neoplasm had much lower mammography and biopsy rates than the other two categories.

1. INTRODUCTION

Computerized records of medical care utilization for the 5 percent sample during the period from October 1966 to December 1973 were used to identify women who had at least one contact at which a diagnosis of benign neoplasm of the breast, unspecified neoplasm of the breast (7th edition ICDA codes 213.0 and 232.0, respectively), or the symptom breast swelling or mass (HSRC symptom code T 532) was noted in the medical record. These conditions were considered to be clinically equivalent and these episodes are referred to as episodes of breast lump.

A study episode started with the first mention of breast lump and ended when the diagnosis is updated to cancer, chronic cystic breast disease, or other breast diseases. The breast lump may be either the primary reason for seeking medical care or an associated condition noted at a contact made for other reasons. If the diagnosis of breast lump is not updated during the observation period, the end of the episode is defined as the end of the observation period (December 1973).

The study objectives are: (1) to describe the process of care attributable to the diagnosis of breast lump, (2) to identify patterns or bundles of care which accounted for the variation in the total cost of medical care for these episodes, (3) to identify characteristics of the patient and the medical care system which were associated with these patterns or bundles of care.

2. UNIVARIATE DESCRIPTION OF BREAST LUMPS EPISODE

One hundred eighty-one episodes of medical care for breast lumps were identified. Approximately 20 percent of the episodes had diagnoses of benign breast neoplasm and unspecified breast neoplasm at the index contact. Approximately 60 percent of the episodes qualified for inclusion in the study based on notation of a symptom of breast swelling or mass (Table 14-1). The symptom of breast swelling or mass was noted in 24 percent (18/75) of the episodes for which a diagnosis of benign or unspecified neoplasm was made at the index contact (Tables 14-1 and 14-2).

Breast lumps were considered to be the primary reason for the index contact in 62 percent of the episodes (Table 14-3). There were associated morbidities noted at slightly less than half of the index contacts (Table 14-4).

Table 14-5 shows the diagnoses to which symptoms of breast lumps were updated. Two-thirds of the episodes were not updated to a diagnosis during the observation period. In 7.2 percent of the episodes, there was a diagnosis of cancer (12 breast and 1 trunk); in 19.3 percent of episodes diagnoses of chronic cystic disease were made. There were five diagnoses of mastitis (2.8 percent) and two diagnoses each of lipoma and other diseases of the breast (1.1 percent). The "other" category included dermatitis, senility, and ill-defined disease.

Tables 14-6 and 14-7 show the age distribution at the time of the index contact. Age ranged from 15 to 77 years, the average and median ages being 37.7 and 35.4 years, respectively.

The number of episodes that started in 1973 was twice the annual frequency for 1969-1972 (Table 14-8). The 1966 period was limited to three months, October to December.

Forty-seven percent of the index contacts were with a surgeon, 37 percent with an internist, and 14 percent with an obstetrician/ gynecologist (Table 14-9).

Tables 14-10 and 14-11 show the mixes of specialists seen during the episode. Thirty-three percent (22/66) of the women who initially contacted an internist for their symptoms subsequently contacted a surgeon; similarly, 35 percent (9/26) who initially contacted an obstetrician/gynecologist subsequently saw a surgeon. Overall, 65 percent of the episodes involved a surgeon at some time.

Ten percent of the women had laboratory tests ordered at the index contact of the episode (Table 14-12). These tests included operative specimens (10), blood counts (6), differential smears (4), blood typing (2), hematocrits (4) and urinalysis (3).

Radiologic services were ordered at the index contact of 19 percent of the episodes (Table 14-13). These services consisted of mammography (31), chest and rib films (6), Xerography (1), and bronchography (1).

Half of the episodes were limited to medical care contacts on a single day (Table 14-14). These episodes were assigned an observed duration of 0 days. The largest observed duration was in excess of a year, 402 days. The average and median observed duration were 29.3 days and 0.5 days, respectively.

There were a total of 413 medical care contacts attributable to breast lumps (Table 14-15). The average episode of medical care consisted of 2.3 contacts; the median was 1.5 contacts.

All but three of the contacts were with physicians (Table 14-16). Two-thirds of the contacts were with surgeons, 22 percent with internists and 8 percent with obstetricians.

No laboratory tests were ordered for 74 percent of the episodes (Table 14-17). The average and median numbers of laboratory tests per episode were 0.7 and 0.2, respectively.

Sixty-seven percent of the episodes had no radiology studies (Table 14-18). The average and median number of radiology studies per episode were 0.4 and 0.2, respectively.

Twenty-eight percent of the women had mammography at some time during the observed episode of care (Table 14-19). Twenty-four of the 181 women (13 percent) had a breast biopsy during the episode (Table 14-21). Puncture aspirations of breast cysts and excision of benign breast lesion were performed in 5 percent and 6 percent of the episodes, respectively (Tables 14-22 and 14-23).

Information concerning drugs ordered during the episodes was available for 1972 and 1973. Of the 69 observed episodes which started during 1972-1973, 26 percent had at least one drug order attributed to breast lumps (Table 14-24). There were a total of 39 drug orders of which 10 (26 percent) were ordered at the index contact. The therapeutic classes of the drug orders included male sex hormones, female sex hormones, minor tranquilizers, antibiotics, hypnotic/sedatives, corticosteroids, and antispasmodics. Each of these therapeutic classes occurred in only a few episodes.

The total cost of providing medical care for these observed episodes of breast lumps averaged $35.76 per episode; the median cost was $16.55 (Table 14-25). Sixteen percent of the episodes had no costs assignable to breast lumps. The average and median costs for medical services were $27.79 and $10.15, respectively (Table 14-26). For laboratory and radiology services the average and median costs were $7.97 and $0.46, respectively (Table 14-27). Medical services accounted for 77 percent of the total cost.

3. BIVARIATE DESCRIPTION OF THE EPISODES

a. The Use of Mammography and Biopsy

In 62 percent of the episodes, neither mammography nor biopsy were ordered (Table 14-28). Mammography alone was more frequent (24 percent) than biopsy alone (9 percent). The ordering of mammography and biopsy were statistically independent events, i.e., 13.8 percent of the episodes with mammography had a biopsy (3.9/28.2), and an approximately equal percentage 13.1 percent (9.4/71.8) of episodes without mammography had a biopsy.

The mammography rate was highest for the 30-49 year olds (51 percent) and lowest for women <30 years old (14 percent) (Table 14-29). Episodes with a symptom of mass/swelling at index contact had the highest mammography rate (37 percent); episodes with an index diagnosis of benign neoplasm had the lowest mammography rate (3 percent).

The mammography rate was twice as high when breast lumps was an associated morbidity (42 percent) than when it was the presenting morbidity (20 percent). Conversely, the biopsy rate was higher for breast lump as a presenting morbidity (17 percent) than as an associated morbidity (7 percent).

There was significant variation in the mammography rate by physician specialty at index contact; 42 percent for internists and 15 percent for obstetricians. The biopsy rate was highest for episodes with an index contact with a surgeon (20 percent) and lowest for internists (5 percent). Internists appear far more likely to order mammography and less likely to order biopsy than other specialties.

All of the biopsies were done by surgeons; 21 percent of episodes involving a surgeon had biopsies (Table 14-30). Episodes that had an updated morbidity of breast cancer had the highest mammography and biopsy rates, 50 percent and 42 percent, respectively (Table 14-30). Presumably the remainder of cancer diagnoses were made on an inpatient basis, and inpatient care is not covered by this data system. Episodes with an updated morbidity of benign neoplasm had the lowest mammography rate (8 percent) and those with an updated morbidity of swelling/mass had the lowest biopsy rate (3 percent).

The biopsy rate tended to increase linearly with the number of contacts in the episode. The mammography rate appeared to be a step function of the number of contacts with a marked increase at two contacts.

b. The Cost of Episodes of Care

By definition, all of the episodes for which breast lump was the presenting morbidity at the index contacts had some costs assigned to breast lump (Table 14-31). When breast lump was an associated morbidity at the index contact, 59 percent of the episodes had some costs assigned to the breast lump.

Almost all (98 percent) of the episodes where the index provider was a surgeon had costs assigned to breast lump. About 70 percent of episodes where the index contact was with an ob/gyn had costs assigned to breast lump.

Thirty percent of the episodes that involved a surgeon were single contact episodes (Table 14-32). Eighty-four percent of the episodes that did not involve a surgeon were single contact episodes. Almost all (98 percent) of the episodes involving a surgeon and 59 percent of the episodes not involving a surgeon had some costs assigned to breast lump.

Seventy-seven percent of the episodes with mammography and 41 percent of the episodes without mammography had two or more contacts. Eighty-eight percent of episodes with biopsy and 45 percent of episodes without biopsy had multiple contacts. All episodes with mammography or biopsy had costs assigned to breast lump.

Tables 14-33 and 14-34 show the average duration of observed episodes of care for breast lump. The longest average duration episodes had an index diagnosis of benign neoplasm (52 days); the shortest had unspecified neoplasm as the index diagnosis (13 days).

Episodes with a surgeon as the index provider averaged 44 days; when an ob/gyn was the index provider the average duration was six days. Whether or not a surgeon was involved in the episode had a similar effect on average duration. Epi=odes with mammography or biopsy had an average duration twice as long as those without these procedures. Episodes that were updated to breast cancer had the highest average duration (66 days); episodes updated to chronic cystic disease had the lowest average duration (9 days). The average duration increased linearly with the number of contacts.

Tables 14-35 through 14-41 examine the variation in cost of episodes of care for breast lump over characteristics of the index contact and characteristics of the episode as a whole. Whether breast lump was the presenting or associated morbidity at the index contact, and the specialty of the index provider were the only characteristics of the index contact which were significantly related to the total cost of care (Table 14-35). The average cost for episodes with a presenting index contact was $43.53 (SE=$4.73) compared with $23.22 (SE=$4.63) for episodes with an associated index contact. Of the variation in total cost of care, 4.5 percent was attributable to whether breast lump was the presenting or associated morbidity at the index contact. The average cost ranged from $20.52 (SE=$3.69) for episodes with internist index contacts to $51.85 (SE=$5.77) for episodes with surgeon index contacts. Specialty at index contact accounted for 10.6 percent of the variation of total cost.

The average total cost of episodes involving a surgeon was $51.77 (SE=$4.76) compared with $6.59 (SE=$0.99) for episodes not involving a surgeon (Table 14-36). Whether or not a surgeon was involved in the episode accounted for 21.3 percent of the variation of the total cost.

Episodes involving mammography averaged $48.53 (SE=$7.65) compared with $30.79 (SE=$3.75) for those without mammography. Very little (2.9 percent) of the variation in cost was attributable to mammography. Biopsy was the strongest correlate of total cost, accounting for 56.2 percent of the variation in cost. Episodes with biopsy averaged $125.51 (SE=$9.17) compared to $22.08 (SE=$2.28) for episodes without biopsy.

There was significant variation in the episode cost over categories of updated morbidity; 8.6 percent of the variation was accounted for by this factor. The average cost ranged from \$20.87 (SE=\$3.54) for episodes updated to breast mass/swelling to \$93.33 (SE=\$23.24) for episodes updated to breast cancer. Note that these costs reflect only the period up to the making of the diagnosis and not the treatment of breast cancer.

The number of contacts during the episode was linearly related to the cost of care; 44.6 percent of the variation in cost was attributable to this utilization component.

The variation of cost of medical services over characteristics of the index contact and characteristics of the episodes are shown in Tables 14-37 and 14-38. Medical services accounted for 77.8 percent of the total costs.

The characteristics of the index contact that were significantly correlated with medical service costs were presenting or associated morbidity and provider specialty (Table 14-37). The strengths and directions of these relationships were similar to those for total costs (Table 14-35).

The episode characteristics which were significantly associated with cost of medical services were surgeon in episode, biopsy, updated morbidity and number of contacts (Table 14-38). Mammography, which was significantly associated with total costs (Table 14-36), was not correlated with medical service costs. The strengths and directions of the significant relationships were similar to those for total costs.

Laboratory and radiology services accounted for 22.2 percent of the total costs. The variation of these costs over characteristics of the index contact and of the episode are shown in Tables 14-39 and 14-40, respectively. Although not significantly correlated with total costs or medical service costs, age was significantly correlated with laboratory/ radiology costs (Table 14-39). The average cost increased from $4.73 (SE=$1.05) for women <30 years old to $11.80 (SE=$1.97) for women 50+ years old. Neither presenting/ associated morbidity at index contact nor provider specialty at index contact were significantly related to laboratory/radiology costs.

The same characteristics of the episode which were significantly associated with total and medical service costs were also significant correlates of laboratory/radiology costs (Table 14-40). Mammography accounted for 49.0 percent of variation in laboratory/radiology costs, number of contacts for 33.9 percent of the variation, updated morbidity for 13.4 percent, biopsy for 12.6, and involvement of a surgeon for 9.4 percent. The average laboratory/radiology costs tended to increase with number of contacts. The average laboratory/ radiology cost ranged from $7.23 (SE=$1.14) for episodes updated to mass/swelling to $20.88 (SE=$5.14) for episodes updated to breast cancer. The relationships with biopsy and involvement of a surgeon were weaker than the corresponding relationships with total cost (Table 14-36).

Multivariate Analysis of Episode Costs

In the previous section the relationships between costs of care and individual characteristics of the index contact and of the episode as a whole were analyzed. In this section the effects of combinations of characteristics on episode costs are studied by multivariate statistical methods.

With the exception of updated morbidity, the characteristics of the episode as a whole which significantly related to episode cost are utilization variables and represent resources expended by the health care delivery system (Table 14-36). The characteristics of the index contact (Table 14-35) and the updated morbidity are considered to be characteristics of the patient and system rather than resource inputs.

Figure 14-1 presents the results of AID analysis applied to the utilization variables that were significantly correlated with total cost, i.e., total contacts, whether or not a surgeon was involved in the episode, mammography and biopsy. The following combinations, patterns or bundles of utilization variables account for 66.9 percent of the variation of total costs: (1) biopsy, (2) no biopsy, 3+ contacts, (3) no biopsy, 2- contacts, surgeon in episode, (4) no biopsy, 2- contacts, no surgeon in episode.

As shown by the AID diagram biopsy accounts for 56.2 percent of the variation in the total cost. Among episodes without a biopsy, the number of contacts (3+ versus 2-) account for 27.7 percent of the variation in total cost. Together, biopsy and number of contacts account for 65.1 percent of the variation in cost. Splitting of episodes with no biopsy and 2- contacts by whether or not a surgeon was involved in the episode accounts for 18.2 percent of the variation, raising the total percentage of explained variation to 66.9 percent.

Figure 14-2 shows that the first two breaks for multiple contact episodes are the same as for all episodes (Figure 14-1). The subgroups: (1) biopsy, (2) no biopsy, 2 contacts, (3) no biopsy, 3+ contacts accounted for 57.1 percent of the variation of cost of multiple contact episodes. For single contact episodes the only split was on whether or not a surgeon was involved in the episode, accounting for 16.2 percent of the variation in cost (Figure 14-3).

Figure 14-4 shows the results of an AID analysis of total cost using the following patient/system variables: specialty of index provider, age, index diagnosis, updated diagnosis and presenting/associated morbidity of the index contact. Recall from the bivariate analyses (Table 14-35) that only specialty of index provider and presenting/associated morbidity at index contact were significantly correlated with total cost. From the AID tree it is seen that presenting/associated morbidity does not enter and that the primary break was on surgeon at index contact, followed by breaks on updated morbidity. The total percentage of variation explained was 20.2 percent, of which half (10.4 percent) was accounted for by the surgeon/nonsurgeon break. Among episodes having an index contact with a surgeon the average cost of episodes that were updated to breast cancer, chronic cystic disease or other breast disease, was $76.22 (SE=$11.88) compared with $40.50 (SE=$5.76) for episodes having breast lumps as the updated diagnosis.

Among episodes with a nonsurgeon index provider, the average cost when the updated morbidity was benign neoplasm, breast cancer or other breast disease was $38.04 (SE=$10.91) compared with $15.70 (SE=$2.59) for episodes updated to unspecified neoplasm, chronic cystic disease or mass/swelling.

The AID generated patterns or bundles of care accounted for 66.9 percent of total cost, 67.2 percent of medical service costs and 23.0 percent of laboratory/radiology costs (Table 14-41). The average total cost ranged from $6.59 (SE=$1.01) for pattern 4 to $125.51 (SE=$9.17) for pattern 1.

The pattern of care was significantly correlated with three of the patient/system variables, i.e., presenting/associated morbidity at index contact, provider specialty at index contact and updated morbidity (Table 14-42). Over half (56.5 percent) of episodes with an associated index contact had pattern 4, the lowest cost bundle of care, compared with 21.4 percent for episodes with a presenting index contact.

There is a built-in correlation between pattern of care and provider specialty at index contact since the definition of pattern 4 requires that a surgeon was not involved in the episode. Clearly, episodes which had a surgeon at initial contact can not have pattern 4.

Two-thirds of episodes updated to breast cancer had the two most costly patterns of care (patterns 1 and 2); for episodes updated to chronic cystic disease 45.7 percent had the lowest cost pattern of care (pattern 4).

An alternative approach to examining combinations of utilization variables is shown in Tables 14-43 and 14-44. Defining three levels of number of contacts (1, 2-3, 4+), there were 12 combinations of the three significant utilization variables, biopsy, number of contacts and surgeon in the episode. Average total costs for the eight combinations that had non-zero frequencies are shown in Table 14-43. The first three combination are subgroups of the AID pattern 1. It is seen that within the biopsy group, the average cost increased with number of contacts. Similar trends are seen within the no biopsy-surgeon and no biopsy-no surgeon combinations. The percentage of variation in cost explained by these 8 combinations was 69.4 percent, compared with 66.9 percent explained by the 4 AID patterns. AID provided an effective reduction in number of subgroups, from 8 to 4, with only a loss of 2.5 percent of explained variation.

From Tables 14-38, 14-36 and 14-40 it is seen that mammography was not correlated with cost of medical services and only weakly with total costs. Mammography accounted for 49.0

percent of the variation in laboratory/ radiology costs. The second strongest correlate of laboratory/radiology costs was number of contacts, which accounted for 33.9 percent of the variation. Updated morbidity, biopsy, surgeon in episode, index diagnosis and age showed significant but weaker correlations with laboratory/radiology costs (Tables 14-39 and 14-40). Table 14-45 shows that combinations of mammography and number of contacts accounted for 60.3 percent of the variation in laboratory/radiology costs. Within mammography and no mammography categories the average laboratory/radiology costs tended to increase with number of contacts.

In order to examine the relationships between AID bundles or patterns of care and patient/system variables, multidimensional contingency table analysis using log linear models was employed. Artifactual correlation was avoided by aggregating AID patterns 3 and 4 so that surgeon in the episode is not used in the pattern definition. The aggregated bundles are: (1) biopsy, (2) no biopsy, 3+ contacts, (3) no biopsy, 2- contacts. Specialty at index contact was included as a patient/ system variable, along with presenting/associated morbidity at index contact and updated morbidity. Analysis of the four dimensional contingency table, aggregated bundle by presenting/associated morbidity by provider specialty by updated morbidity, revealed that the only significant two-way effects were bundle by updated morbidity and presenting/associated morbidity by provider specialty. All one-way effects were significant, and no three-way or four-way effects were significant.

These results indicated that although provider specialty at index contact and presenting/associated morbidity are correlated, i.e., surgeons hadd a higher rate of presenting morbidities and internists a higher rate of associated morbidities, neither were significant correlates of the aggregated bundle. Only the updated morbidity showed a significant correlation with aggregated bundle. Episodes updated to breast cancer were more likely to involve a biopsy and less likely to be limited to two or less contacts. Episodes updated to breast mass/swelling were more likely to have two or less contacts and less likely to involve a biopsy. The other updated morbidities did not differ from the overall distribution of aggregated bundles.

These results should be interpreted with caution since they assume that the updated morbidity is a characteristics of the patient at the time of the initial contact and that it is invariant over the duration of the episode. In the case of breast cancer, this approach assumes that the cancer was present at the initial contact and that we are observing the episode of care required for establishing the diagnosis. The validity of medical records technicians' assessment of when breast cancer was present, based on providers notes in the medical record is assumed by this approach. The small number of breast cancer patients, 12, also limits the generality of these findings.

DISCUSSION OF FINDINGS

Two-thirds of the study episodes of breast lump were not updated to a different diagnosis during the observation period. 19.3 percent of the episodes were updated to chronic cystic disease and 7.2 percent to cancer. Half of the episodes (49.2 percent) consisted of a single contact with the medical care program. The average and median number of contacts per episode were 2.3 and 1.5, respectively. Half of the episodes (50.3 percent) were limited to medical care contacts on a single day. The average and median observed duration were 29.3 days and 0.5 days, respectively. 29.2 percent of the episodes involved a mammography and 13.3 percent a biopsy.

The specialty of the provider at the index contact of the episode of care for breast lump was a significant correlate of the use of mammography and biopsy during the episode. The mammography rate was high (42.4 percent) and the biopsy rate low (4.5 percent) when the index provider was an internist. When the index provider was an ob/gyn or a surgeon, the mammography and biopsy rates were 20.8 percent and 18.9 percent, respectively.

Episodes for which breast lump was an associated morbidity at the index contact had a high mammography rate (42.0 percent) and a low biopsy rate (7.2 percent). When breast lump was the presenting morbidity the mammography and biopsy rates were 19.6 percent and 17.0 percent, respectively. These differences are explained by the correlation between morbidity status and index provider. When breast lump was an associated morbidity 72.5 percent of the index providers were internists, compared to 14.3 percent for episodes with a presenting morbidity of breast lump.

We have seen that 67 percent of the variation in cost of care for observed episodes of "breast lumps" is accounted for by four combinations or bundles of utilization variables: (1) biopsy, (2) no biopsy, 3+ contacts, (3) no biopsy, 2-contacts, surgeon involved in episode, (4) no biopsy, 2-contacts, no surgeon involved in episode. For episodes with multiple contacts combinations of biopsy and number of contacts accounted for 57 percent of the variation in total cost.

The single variable, surgeon in episode, accounted for 16 percent of variation in cost of single contact episodes. The biopsy rate for single contact episodes involving a surgeon was 8.6 percent. There were no biopsies for single contact episodes involving other providers. The biopsy rate for multiple contact episodes with a surgeon as the index provider was 28.0 percent compared to 17.1 percent for multiple contact episodes with an ob/gyn or internist as the index provider. There are two possible explanations for the higher biopsy rate when a surgeon is the index provider. Either surgeons were seeing cases of breast lump that had a greater likelihood of being malignant, and thus required biopsy, or the cases were homogeous and surgeons had a greater propensity for biopsy than other providers. It was not possible to distinguish between these alternatives based on the data of this study.

Patient/system variables were less strongly correlated with total cost of episode. Combinations of surgeon at initial contact and updated morbidity accounted for 20 percent of the variation in episode costs.

Updated morbidity and presenting/associated morbidity at index contact were significantly correlated with bundles of utilization [(1) biopsy, (2) no biopsy, 3+ contacts, (3) no biopsy, 2-contacts, surgeon in episode, (4) no biopsy, 2- contacts, no surgeon in episode]. Episodes updated to breast cancer were more likely to involve the high cost bundles of care [bundles (1) and (2)].

Substantial differences in the relative frequencies of bundles (3) and (4) are associated with the presenting/associated morbidity of the index contact.

The only patient/system variable that was significantly correlated with the three aggregated bundles (1), (2), (3+4) was updated morbidity; episodes updated to breast cancer were more likely to involve high cost bundles of care, i.e., biopsy and 3+ contacts.

In any future studies of resource expenditures for episodes of disease the choice of "breast lump" should be reconsidered and alternatives considered. The definition of an episode of "breast lump" used in the current study, starting with the first mention of "breast lump" and ending when the morbidity is updated, resulted in half (89/181) of the study episodes having a single contact, and 15.5 percent having no costs attributable to "breast lump." The average cost of the study episodes was only \$35.79 (SE=\$3.32).

Furthermore, the assumption that homogeneous or clinically equivalent episodes of care are obtained by selecting on index diagnoses of benign neoplasm of the breast, unspecified neoplasm of the breast, and breast swelling or mass was not supported by the findings of this study. Although the total cost and cost of medical services were not significantly correlated with index diagnosis, the average laboratory/radiology costs were significantly lower for benign neoplasm than for unspecified neoplasm or breast swelling/mass ($p=.003$, $\eta^2=.064$). Episodes with an index diagnosis of benign neoplasm had much lower mammography ($p=.001$) and biopsy ($p=.084$) rates than the other two categories.

Rather than attempting to define a homogeneous group of episodes of "breast lump" and limiting the study to the process of care prior to updating of the index diagnosis, a more clinically meaningful study population of episodes of care, which would involve much greater inputs of medical care resources, would be the broader category of benign breast disease. This would include "breast lump," all forms of fibrocystic disease, and fibroadenoma. The duration of such episodes of care would be from the first mention during the observation period through the last mention prior to end of observation or diagnosis of breast cancer.

In addition to providing a description of the process of care for benign breast disease, the relationship between process of care and risk of breast cancer could be examined if large numbers of episodes were available.

Finally, no explanation has been found for the unexpected large number of episodes starting in 1973 (Table 14-8).

TABLE 14-1

Diagnosis at Index Contact of Breast Lump Episodes

Diagnosis at Index Contact	Number	Percent
2130, Benign Neo Breast	35	19.3%
2320, Unspecified Neo Breast	40	22.1
T532, Breast Swelling/Mass	106	58.6
Total	181	100.0%

TABLE 14-2

Symptom of Breast Mass/Swelling at Index Contact

Symptom Recorded	Number	Percent
No	57	31.5%
Yes	124	68.5
Total	181	100.0%

TABLE 14-3

Morbidity Status at Index Contact of Breast Lump Episodes

	Number	Percent
Presenting	112	61.9%
Associated	69	38.1
Total	181	100.0%

TABLE 14-4

Number of Associated Morbidities at Index Contact for Breast Lump Episodes

Number of Associated Morbidities	Number	Percent
0	96	53.0%
1	47	26.0
2	18	9.9
3	10	5.5
4	6	3.3
5	3	1.7
7	1	0.6
Total	181	100.0%

TABLE 14-5

Updated Presenting or Associated Morbidity for Breast Lump Episodes

Updated Morbidity	Number	Percent
Breast Cancer	12	6.6%
Cancer of the Trunk	1	0.6
Benign Neoplasm	36	19.9
Lipoma	2	1.2
Unspecified Neoplasm	22	12.2
Chronic Cystic Breast Disease	35	19.3
Mastitis	5	2.8
Other Diseases of Breast	2	1.1
Breast Swelling/Mass	62	34.3
Other	4	2.2
Total	181	100.0%

TABLE 14-6

Age at Index Contact for Breast Lump Episodes

Age	Number	Percent
<30	66	36.5%
30-49	81	44.8
50+	34	18.8
Total	181	100.0%

TABLE 14-7

Age at Index Contact for Breast Lump Episodes

Age	Number	Percent
<20 Yrs	12	6.6%
20-24	18	9.9
25-29	36	19.9
30-34	21	11.6
35-39	15	8.3
40-44	25	13.8
45-49	20	11.0
50-54	13	7.2
55-59	6	3.3
60-64	4	2.2
65-69	6	3.3
70+ Yrs	5	2.8
Total	181	100.0%

Average age = 37.7 years, median age = 35.4 years

TABLE 14-8

Year of Index Contact for Breast Lump Episodes

Year	Number	Percent
1966	3	1.7%
1967	17	9.4
1968	15	8.3
1969	26	14.4
1970	24	13.3
1971	27	14.9
1972	22	12.2
1973	47	26.0
Total	181	100.0%

TABLE 14-9

Specialty of Physician Seen at Index Contact for Breast Lump Episodes

Specialty	Number	Percent
Internal Medicine	66	36.5%
Obstetrics/Gynecology	26	14.4
Surgery/Emergency Surgery	85	47.0
Miscellaneous	4	2.2
Total	181	100.0%

TABLE 14-10

Mix of Specialists Seen During Breast Lump Episodes

Specialty Mix	Number	Percent
Internist, 0 Surgery	44	24.3%
Internist, Surgery	22	12.2
Ob/Gyn, 0 Surgery	17	9.4
Ob/Gyn, Surgery	9	5.0
1 Surgery Contact	36	19.9
2+ Surgery Contacts	49	27.1
Other, 0 Surgery	3	1.7
Other, Surgery	1	0.6
Total	181	100.0%

TABLE 14-11

Surgical Contacts During Breast Lump Episodes

Surgical Contacts During Episode	Number	Percent
No Surgery	64	35.4%
Surgery	117	64.6
Total	181	100.0%

TABLE 14-12

Number of Laboratory Tests for Breast Lumps at Index Contact

Number of Laboratory Tests	Number	Percent
0	163	90.1%
1	11	6.1
2	2	1.1
3	2	1.1
4	1	0.6
5	1	0.6
6	1	0.6
Total	181	100.0%

TABLE 14-13

Number of Radiology Services for Breast Lumps at Index Contact

Number of Radiology Services	Number	Percent
0	146	80.7%
1	32	17.7
2	2	1.1
3	1	0.6
Total	181	100.0%

TABLE 14-14

Duration of Breast Lump Episodes

Duration	Number	Percent
One Visit	91	50.3%
1-14 Days	28	15.5
15-30	21	11.6
31+	41	22.7
Total	181	100.0%

Average duration = 29.3 days, median duration = 0.5 days

TABLE 14-15

Number of Contacts During Breast Lump Episodes

Number of Contacts	Number	Percent
One	89	49.2%
Two	39	21.5
Three	16	8.8
Four	17	9.5
5-14	20	11.0
Total	181	100.0%

Total contacts = 413, average = 2.3, median = 1.5, mode = 1.0

TABLE 14-16

Number of Contacts During Observed Breast Lump Episodes by Provider

Provider	Number of Contacts		Percent	
All Physicians	410		99.3%	
Internists		90		21.8
Obstetrics/Gynecology		34		8.2
Surgeons		280		67.8
Other		6		1.5
Nonphysicians	3		0.7	
Total	413		100.0%	

TABLE 14-17

Number of Laboratory Tests During Episode for Breast Lump Episodes

Number of Tests	Number	Percent
0	134	74.0%
1	18	9.9
2	3	1.7
3	16	8.8
4	4	2.2
5	4	2.2
6	1	0.6
7	1	0.6
Total	181	100.0%

Total tests = 121, average = 0.67, median = 0.18

TABLE 14-18

Number of Radiology Tests During Breast Lump Episodes

Number of Tests	Number	Percent
0	122	67.4%
1	52	28.7
2	6	3.3
3	1	0.6
Total	181	100.0%

Total tests = 67, average = 0.37, median = 0.24

TABLE 14-19

Number of Breast Lump Episodes During which Mammography was Performed

Mammography	Number	Percent
No	130	71.8%
Yes	51	28.2
Total	181	100.0%

TABLE 14-20

Frequency of Mammography for Breast Lump Episodes

Frequency of Mammography	Number	Percent
None	130	71.8%
One	49	27.1
Two	2	1.1
Total	181	100.0%

TABLE 14-21

Number of Breast Biopsies

Number Biopsies	Number	Percent
0	157	86.7%
1	23	12.7
2	1	0.6
Total	181	100.0%

TABLE 14-22

Number of Puncture Aspirations of Breast Cysts

Number Aspirations	Number	Percent
0	172	95.0%
1	6	3.3
2	2	1.1
3	1	0.6
Total	181	100.0%

TABLE 14-23

Number of Excisions of Benign Breast Lesions

Number of Excisions	Number	Percent
0	170	93.9%
1	11	6.1
Total	181	100.0%

TABLE 14-24

Number of Drugs Ordered During Episode, 1972-1973 for Breast Lump Episodes

Number of Drugs Ordered	Number	Percent
0	51	73.9%
1	5	7.2
2	5	7.2
3	8	11.6
Total	69	100.0%

TABLE 14-25

Total Cost of Breast Lump Episodes

Cost (Dollars)	Number	Percent
0	28	15.5%
1-5	13	7.2
6-10	34	18.8
11-20	34	18.8
21-50	32	17.7
51-90	6	3.3
91-310	34	18.8
Total	181	100.0%

Average = $35.76 SD = $46.96
Median = $16.55

TABLE 14-26

Cost of Medical Services for Breast Lump Episodes

Cost (Dollars)	Number	Percent
0	37	20.4%
1-5	24	13.3
6-10	45	24.9
11-20	27	14.9
21-50	11	6.1
51-90	15	8.3
91-270	22	12.2
Total	181	100.0%

Average = $27.79 SD = $41.18
Median = $10.15

TABLE 14-27

Cost of Laboratory and Radiology Tests for Breast Lump Episodes

Cost (Dollars)	Number	Percent
0	94	51.9%
1-10	17	9.4
11-20	52	28.7
21-30	11	6.1
31-40	5	2.8
41-56	2	1.1
Total	181	100.0%

Average = $7.97 SD = $10.35
Median = $0.46

TABLE 14-28

Relative Frequency of Mammography and Biopsy in Breast Lump Episodes

	Number	Percent
Mammography Alone	44	24.3%
Biopsy Alone	17	9.4
Mammography and Biopsy	7	3.9
Neither	113	62.4
Total	181	100.0
Mammography	51	28.2
Biopsy	24	13.3

TABLE 14-29

Relative Frequency of Mammography and Biopsy
by Characteristics of the Index Contact
for Breast Lump Episodes

Age	Number	Percent with Mammography	Percent with Biopsy
<30	66	13.7%	29.2%
30-49	81	51.0	50.0
50+	34	35.3	20.8
Total	181	28.2%	13.3%
p-value		< 0.001	0.728

Index Diagnoses	Number	Percent with Mammography	Percent with Biopsy
2130, Benign Neoplasm	35	2.9%	2.9%
2320, Unspecified Neoplasm	40	27.5	20.0
T532, Swelling/Mass	106	36.8	14.2
Total	181	28.2	13.3
p-value		0.001	0.084

Morbidity Status at Index Contact	Number	Percent with Mammography	Percent with Biopsy
Presenting	112	19.6%	17.0%
Associated	69	42.0	7.2
Total	181	28.2	13.3
p-value		0.002	0.010

continued next page

Table 29 continued

Year of Index Contact	Number	Percent with Mammography	Percent with Biopsy
1966-68	35	42.9%	8.6%
1969-70	50	28.0	10.0
1971-72	49	22.4	18.4
1973	47	23.4	14.9
Total	181	28.2	13.3
p-value		0.168	0.503

MD Specialty at Index Contact	Number	Percent with Mammography	Percent with Biopsy
Internal Medicine	66	42.4%	4.5%
Obstetrics/Gynecology	26	15.4	15.4
Surgeon	85	22.4	20.0
Miscellaneous	4	0.0	0.0
Total	181	28.2	13.3
p-value		0.008	0.038

TABLE 14-30

Relative Frequency of Mammography and Biopsy by Characteristics of Breast Lump Episodes

Surgeon Involved With Episode	Number	Percent with Mammography	Percent with Biopsy
No	64	21.9%	0.0%
Yes	117	31.6	20.5
Total	181	28.2	13.3
p-value		0.222	< 0.001
Updated Morbidity			
Breast Cancer	12	50.0%	41.7%
Benign Neoplasm	36	8.3	13.9
Unspecified Neoplasm	22	27.3	13.6
Chronic Cystic Disease	35	22.9	14.3
Swelling/Mass	62	38.7	3.2
Other	14	28.6	28.6
Total	181	28.2	13.3
p-value		0.017	0.005
Number of Contacts			
1	89	13.5%	3.4%
2	39	41.0	10.3
3	16	50.0	25.0
4	17	29.4	23.5
5-14	20	50.0	45.0
Total	181	28.2	13.3
p-value		< 0.001	< 0.001

TABLE 14-31

Relative Frequency of Episodes with Multiple Contacts and Non-Zero Costs by Characteristics of Index Contact for Breast Lump Episodes

Age	Number	Percent with Multiple Contacts	Percent with Non-Zero Costs
<30	66	42.4%	83.3%
30-49	81	56.8	85.2
50+	34	52.9	85.3
Total	181	50.8	84.5
p-value		0.215	0.945
Index Diagnosis			
2130, Benigh Neoplasm	35	51.4%	80.0%
2320, Unspecified Neoplasm	40	55.0	85.0
T532, Swelling/Mass	106	49.1	85.8
Total	181	50.8	84.5
p-value		0.812	0.706
Morbidity Status at Index Contact			
Presenting	112	50.0	100.0
Associated	69	52.2	59.4
Total	181	50.8	84.5
p-value		0.896	< 0.001

Table 31 continued

Year of Index Contact			
1966-68	35	54.3%	82.9%
1969-70	50	40.0	80.0
1971-72	49	55.1	83.7
1973	47	55.3	91.5
Total	181	50.8	84.5
p-value		0.355	0.453

MD Specialty at Contact	Number	Percent with Multiple Contacts	Percent with Non-Zero Costs
Internal Medicine	66	48.5%	74.2%
Obstetrics/Gynecology	26	34.6	69.2
Surgeon	85	58.8	97.6
Miscellaneous	4	25.0	75.0
Total	181	50.8	84.5
p-value		0.106	< 0.001

TABLE 14-32

Relative Frequency of Breast Lump Episodes with Multiple Contacts and Non-Zero Costs by Characteristics of the Episode

Surgeon Involved in Episode	Number	Percent with Multiple Contacts	Percent with Non-Zero Costs
No	64	15.6%	59.4%
Yes	117	70.1	98.3
Total	181	50.8	84.5
p-value		< 0.001	< 0.001
Mammography			
No	130	40.8%	78.5%
Yes	51	76.5	100.0
Total	181	50.8	84.5
p-value		< 0.001	0.001
Biopsy			
No	157	45.2%	82.2%
Yes	24	87.5	100.0
Total	181	50.8	84.5
p-value		< 0.001	0.052
Updated Morbidity			
Breast Cancer	12	75.0%	91.7%
Benign Neoplasm	36	58.3	80.6
Unspecified Neoplasm	22	63.6	86.4
Chronic Cystic Disease	35	45.7	82.9
Swelling/Mass	62	50.0	85.7
Other	14	50.0	85.7
Total	181	50.8	84.5
p-value		0.147	0.955

TABLE 14-33

Duration of Episode of Medical Care by Characteristics of the Index Contact of Breast Lump Episodes

	All Episodes				Episodes with Duration > 0			
Age	N	Average Duration (Days)	SD	SE	N	Average Duration (Days)	SD	SE
<30	66	31.17	72.20		28	73.46	96.57	
30-49	81	29.16	59.79		45	52.49	72.45	
50+	34	25.76	69.16		17	51.53	91.95	
Total	181	29.25	66.31		90	58.83	84.28	
		p=0.928	eta^2=0.001			p=0.544	eta^2=0.014	
Index Diagnosis								
Benign Neoplasm	35	51.83	99.11		18	100.78	120.09	
Unspecified Neoplasm	40	12.73	20.91		21	24.24	23.66	
Mass	106	28.04	61.98		51	58.27	79.19	
Total	181	29.25	65.10		90	58.83	80.94	
		p=0.035	eta^2=0.037			p=0.016	eta^2=0.091	
Morbidity Status at Index Contact								
Presenting	112	34.86	74.97		55	70.98	94.98	
Associated	69	20.16	47.01		35	39.74	60.15	
Total	181	29.25	65.76		90	58.83	82.97	
		p=0.146	eta^2=0.012			p=0.085	eta^2=0.033	
Year								
1966-68	35	39.17	83.10		18	76.17	104.05	
1969-70	50	18.34	51.09		19	48.26	74.70	
1971-72	49	41.08	83.77		27	74.56	101.80	
1973	47	21.15	37.46		26	38.23	43.62	
Total	181	29.25	65.70		90	58.83	83.63	
		p=0.218	eta^2=0.025			p=0.314	eta^2=0.040	
MD Specialty at Index Contact								
Internal Medicine	66	21.55	49.97		31	45.87	65.24	
Obstetrics/Gynecology	26	5.88	11.50		8	19.13	13.54	
Surgery	85	43.46	63.09		50	73.88	97.68	
Miscellaneous	4	6.50	13.00		1	26.00	0.00	
Total	181	29.25	64.92		90	58.83	83.28	
		p=0.034	eta^2=0.048			p=0.233	eta^2=0.048	

TABLE 14-34

Duration of Episode of Medical Care by Characteristics of the Breast Lump Episodes

	All Episodes				Episodes with Non-Zero Duration			
Surgeon in Episode	N	Average Duration (Days)	SD	SE	N	Average Duration (Days)	SD	SE
No	64	4.22	11.79		10	27.00	17.00	
Yes	117	42.95	78.37		80	62.81	88.07	
Total	181	29.25	63.48		90	58.83	83.62	
	$p<0.001$		$eta^2=0.079$		$p=0.205$		$eta^2=0.018$	
Mammography								
No	130	20.48	52.51		53	50.25	72.91	
Yes	51	51.61	88.57		37	71.14	97.30	
Total	181	29.25	64.64		90	59.83	83.75	
	$p=0.004$		$eta^2=0.045$		$p=0.247$		$eta^2=0.015$	
Biopsy								
No	157	25.37	64.75		69	57.72	87.88	
Yes	24	54.67	69.62		21	62.48	71.15	
Total	181	29.25	65.39		90	58.83	84.37	
Updated Morbidity								
Breast Cancer	12	65.67	130.32		9	87.56	145.59	
Benign Neoplasm	36	57.97	100.23		21	99.38	115.15	
Unspecified Neoplasm	22	15.77	23.16		13	26.69	24.96	
Chronic Cystic	35	9.29	21.85		15	21.67	29.53	
Mass	62	24.15	48.50		25	59.88	61.23	
Other	14	17.93	23.17		7	35.86	20.33	
Total	181	29.25	63.98		90	58.83	80.69	
	$p=0.008$		$eta^2=0.086$		$p=0.040$		$eta^2=0.127$	
Number of Contacts								
1	89	0.00	0.00					
2	39	21.10	24.93		37	21.19	25.15	
3	16	46.50	49.06		16	46.50	49.06	
4	17	85.24	104.95		17	85.24	104.95	
5-14	20	115.90	116.93		20	115.90	116.93	
Total	181	29.25	53.07		90	58.83	75.86	
	$p<0.001$		$eta^2=0.367$		$p<0.001$		$eta^2=0.210$	

TABLE 14-35

Total Cost of Episodes by Characteristics of the Index Contact of Breast Lump Episodes

	All Episodes				Episodes with Non-Zero Costs			
	N	Avg. Cost ($)	SD	SE	N	Avg. Cost ($)	SD	SE
Age								
<30	66	32.21	44.88		55	38.65	46.59	
30-49	81	35.85	42.31		69	42.09	42.80	
50+	34	42.59	60.19		29	49.93	62.37	
Total	181	35.79	47.03		153	42.34	48.24	
	$p=0.580$		$eta^2=0.006$		$p=0.597$		$eta^2=0.007$	
Index Diagnoses								
Benign Neoplasm	35	30.26	40.88		28	37.83	42.51	
Unspecified Neoplasm	40	41.50	45.50		34	48.83	45.59	
Mass	106	35.46	49.39		91	41.31	51.01	
Total	181	35.79	47.03		151	42.34	48.41	
	$p=0.584$		$eta^2=0.006$		$p=0.640$		$eta^2=0.006$	
Morbidity Status at Index								
Presenting	112	43.53	50.04	4.73	112	43.53	50.04	
Associated	69	23.22	38.45	4.63	41	39.08	43.34	
Total	181	35.79	45.98		153	42.34	48.35	
	$p=0.004$		$eta^2=0.045$		$p=0.614$		$eta^2=0.002$	
Year								
1966-68	35	35.56	43.35		29	41.71	44.42	
1969-70	50	25.33	32.91		40	31.66	33.98	
1971-72	49	46.90	62.24		41	56.06	64.21	
1973	47	36.25	42.11		43	39.62	42.49	
Total	181	35.79	46.61		153	42.34	47.84	
	$p=0.153$		$eta^2=0.029$		$p=0.143$		$eta^2=0.036$	
MD Specialty at Index Contact								
Internal Medicine	66	20.52	29.92	3.69	49	27.64	31.81	
Obstetrics/Gynecology	26	25.20	47.69	5.77	18	36.41	53.97	
Surgeon	85	51.85	53.18		83	53.10	53.20	
Miscellaneous	4	15.28	22.62		3	20.37	24.74	
Total	181	35.79	44.73		153	42.34	47.16	
	$p<0.001$		$eta^2=0.106$		$p=0.021$		$eta^2=0.063$	

TABLE 14-36

Total Cost of Episodes by Characteristics of the Breast Lump Episode

	All Episodes				Episodes with Non-Zero Costs			
Surgeon in Episode	N	Avg. Cost ($)	SD	SE	N	Avg. Cost ($)	SD	SE
No	64	6.59	7.92	0.99	38	11.09	7.45	
Yes	117	51.77	51.50	4.76	115	52.67	51.49	
Total	181	35.79	41.73		153	42.34	44.89	
	$p<0.001$		$eta^2=0.213$		$p<0.001$		$eta^2=0.140$	
Mammography								
No	130	30.79	42.70	3.75	102	39.25	44.65	
Yes	51	48.53	54.66	7.65	51	48.53	54.66	
Total	181	35.79	46.35		153	42.34	48.19	
	$p=0.022$		$eta^2=0.029$		$p=0.263$		$eta^2=0.008$	
Biopsy								
No	157	22.08	28.53	2.28	129	26.87	29.36	
Yes	24	125.51	44.92	9.17	24	125.51	44.92	
Total	181	35.79	31.12		153	42.34	32.22	
	$p<0.001$		$eta^2=0.562$		$p<0.001$		$eta^2=0.557$	
Updated Morbidity								
Breast Cancer	12	93.33	80.49	23.24	11	101.82	78.59	
Benign Neoplasm	36	45.26	54.50		29	56.19	55.47	
Unspecified Neoplasm	22	31.71	39.22		19	36.72	40.01	
Chronic Cystic	35	31.01	38.08		29	37.43	38.89	
Mass	62	20.87	27.88	3.54	53	24.41	28.70	
Other	14	46.56	49.81		12	54.33	49.72	
Total	181	35.79	43.85		153	42.34	44.35	
	$p=0.008$		$eta^2=0.086$		$p=0.000$		$eta^2=0.183$	
Number of Contacts								
1	89	12.98	21.85		63	18.33	24.04	
2	39	31.91	32.29		37	33.64	32.26	
3	16	61.01	41.72		16	61.01	41.72	
4	17	50.90	41.97		17	50.90	41.97	
5-14	20	111.87	66.28		20	111.87	66.28	
Total	181	35.79	35.30		153	42.34	37.76	
	$p<0.001$		$eta^2=0.446$		$p<0.001$		$eta^2=0.403$	

TABLE 14-37

Cost of Medical Services by Characteristics of the Index Contact of Breast Lump Episodes

	All Episodes				Episodes with Non-Zero Duration			
	N	Average Medical Cost ($)	SD	SE	N	Average Medical Cost ($)	SD	SE
Age								
<30	66	27.48	39.72		55	32.97	41.40	
30-49	81	26.90	36.56		69	31.57	37.72	
50+	34	30.79	53.69		29	36.10	56.55	
Total	181	27.84	41.36		153	32.93	43.12	
	p=0.896		eta^2=0.001		p=0.893		eta^2=0.002	
Index Diagnosis								
Benign Neoplasm	35	27.57	36.36		28	34.46	37.67	
Unspecified Neoplasm	40	31.66	39.73		34	37.25	40.64	
Mass	106	26.49	43.38		91	30.85	45.38	
Total	181	27.84	41.34		153	32.93	43.06	
	p=0.796		eta^2=0.003		p=0.745		eta^2=0.004	
Morbidity Status at Index								
Presenting	112	35.71	43.62		112	35.71	43.62	
Associated	69	15.07	33.33		41	25.37	40.27	
Total	181	27.84	40.02		153	32.93	42.76	
	p=0.001		eta^2=0.060		p=0.187		eta^2=0.012	
Year								
1966-68	35	26.01	38.16		29	31.40	39.91	
1969-70	50	18.34	28.03		40	22.93	29.66	
1971-72	49	38.02	54.57		41	45.44	56.81	
1973	47	28.69	37.38		43	31.36	38.01	
Total	181	27.84	40.84		153	32.93	42.46	
	p=0.124		eta^2=0.032		p=0.123		eta^2=0.038	
MD Specialty at Index Contact								
Internal Medicine	66	12.42	24.67		49	16.72	27.39	
Obstetrics/Gynecology	26	20.87	42.70		18	30.14	48.84	
Surgery	85	42.78	46.57		83	43.81	46.64	
Miscellaneous	4	10.25	12.89		3	13.67	13.38	
Total	181	27.84	38.89		153	32.93	41.39	
	p<0.001		eta^2=0.122		p=0.004		eta^2=0.086	

TABLE 14-38

Cost of Medical Services by Characteristics of the Breast Lump Episode

	All Episodes				Episodes with Non-Zero Duration			
Surgeon in Episode	N	Average Medical Cost ($)	SD	SE	N	Average Medical Cost ($)	SD	SE
No	64	2.91	4.08		38	4.89	4.29	
Yes	117	41.48	45.71		115	42.20	45.77	
Total	181	27.84	36.87		153	32.93	39.83	
	$p<0.001$		eta^{2}=0.202		$p<0.001$		eta^{2}=0.142	
Mammography								
No	130	27.36	38.12		102	34.87	39.89	
Yes	51	29.07	48.46		51	29.07	48.46	
Total	181	27.84	41.27		153	32.93	42.92	
	$p=0.802$		eta^{2}=0.000		$p=0.432$		eta^{2}=0.004	
Biopsy								
No	157	15.55	23.82		129	18.93	25.05	
Yes	24	108.21	40.48		24	103.21	40.48	
Total	181	27.84	26.55		153	32.93	27.95	
	$p<0.001$		eta^{2}=0.202		$p<0.001$		eta^{2}=0.142	
Updated Morbidity								
Breast Cancer	12	72.46	71.62		11	79.05	71.20	
Benign Neoplasm	36	40.68	48.49		29	50.50	49.25	
Unspecified Neoplasm	22	23.16	33.78		19	26.82	35.03	
Chronic Cystic	35	24.09	34.87		29	29.07	36.42	
Mass	62	13.64	21.99		53	15.95	23.02	
Other	14	36.21	45.67		12	42.25	46.76	
Total	181	27.84	38.59		153	32.93	39.51	
	$p<0.001$		eta^{2}=0.145		$p<0.001$		eta^{2}=0.178	
Number of Contacts								
1	89	9.94	19.61		63	14.04	22.08	
2	39	22.09	28.71		37	23.28	29.01	
3	16	46.34	39.71		16	46.34	39.71	
4	17	43.38	39.97		17	43.38	39.97	
5-14	20	90.70	61.60		20	90.70	61.60	
Total	181	27.84	32.55		153	32.93	35.05	
	$p<0.001$		eta^{2}=0.388		$p<0.001$		eta^{2}=0.349	

TABLE 14-39

Cost of Laboratory and Radiology Services by Characteristics of Index Contact of Breast Lump Episodes

	All Episodes				Episodes with Non-Zero Total Cost			
	N	Average Lab/Rad. Cost ($)	SD	SE	N	Average Lab/Rad. Cost ($)	SD	SE
Age								
<30	66	4.73	8.52	1.05	55	5.68	9.05	
30-49	81	8.96	10.52		69	10.52	10.66	
50+	34	11.80	11.48	1.97	29	13.83	11.23	
Total	181	7.95	10.03		153	9.41	10.22	
	p=0.002		eta^2=0.066		p=0.002		eta^2=0.083	
Index Diagnosis								
Benign Neoplasm	35	2.69	5.82		28	3.36	6.35	
Unspecified Neoplasm	40	9.84	10.49		34	11.58	10.45	
Mass	106	8.97	10.92		91	10.45	11.12	
Total	181	7.95	10.05		153	9.41	10.27	
	p=0.003		eta^2=0.064		p=0.003		eta^2=0.075	
Morbidity Status at Index								
Presenting	112	7.83	10.92		112	7.83	10.92	
Associated	69	8.15	9.35		41	13.71	8.39	
Total	181	7.95	10.35		153	9.41	10.31	
	p=0.841		eta^2=0.000		p=0.002		eta^2=0.061	
Number of Contacts								
1966-68	35	8.55	11.95		29	10.31	12.43	
1969-70	50	6.99	9.79		40	8.74	10.23	
1971-72	49	8.88	10.97		41	10.62	11.21	
1973	47	7.56	9.03		43	8.26	9.13	
Total	181	7.95	10.38		153	9.41	10.66	
	p=0.800		eta^2=0.006		p=0.708		eta^2=0.009	
MD Specialty at Index Contact								
Internal Medicine	66	8.10	9.19		49	10.92	9.11	
Obstetrics/Gynecology	26	4.34	7.95		18	6.27	8.95	
Surgery	85	9.07	11.62		83	9.29	11.67	
Miscellaneous	4	5.03	10.05		3	6.70	11.60	
Total	181	5.03	10.05		153	9.41	10.61	
	p=0.211		eta^2=0.025		p=0.431		eta^2=0.018	

TABLE 14-40

Cost of Medical Services by Characteristics of the Breast Lump Episode

	All Episodes				Episodes with Non-Zero Duration			
Surgeon in Episode	N	Average Lab/Rad. Cost ($)	SD	SE	N	Average Lab/Rad. Cost ($)	SD	SE
No	64	3.68	6.67		38	6.20	7.72	
Yes	117	10.29	11.21		115	10.47	11.23	
Total	181	7.95	9.86		153	9.41	10.48	
	$p<0.001$		$\text{eta}^2=0.094$		$p=0.031$		$\text{eta}^2=0.030$	
Mammography								
No	130	3.44	6.40		102	4.38	6.94	
Yes	51	19.46	9.49		51	19.46	9.49	
Total	181	7.95	7.39		153	9.41	7.88	
	$p<0.001$		$\text{eta}^2=0.490$		$p<0.001$		$\text{eta}^2=0.452$	
Biopsy								
No	157	6.52	9.59		129	7.94	10.04	
Yes	24	17.30	10.28		24	17.30	10.28	
Total	181	7.95	9.68		153	9.41	10.07	
	$p<0.001$		$\text{eta}^2=0.126$		$p<0.001$		$\text{eta}^2=0.104$	
Updated Morbidity								
Breast Cancer	12	20.88	18.75	5.41	11	22.77	18.41	
Benign Neoplasm	36	4.58	8.25		29	5.69	8.87	
Unspecified Neoplasm	22	8.55	10.16		19	9.90	10.31	
Chronic Cystic	35	6.93	7.38		29	8.36	7.34	
Mass	62	7.23	8.94	1.14	53	8.46	9.12	
Other	14	10.35	10.65		12	12.08	10.56	
Total	181	7.95	9.75		153	9.41	9.95	
	$p<0.001$		$\text{eta}^2=0.134$		$p<0.001$		$\text{eta}^2=0.148$	
Number of Contacts								
1	89	3.04	6.62		63	4.29	7.53	
2	39	9.82	9.59		37	10.35	9.56	
3	16	14.66	6.86		16	14.66	6.86	
4	17	7.52	8.24		17	7.52	8.24	
5-14	20	21.17	13.67		20	21.17	13.67	
Total	181	7.95	8.49		153	9.41	9.06	
	$p<0.001$		$\text{eta}^2=0.339$		$p<0.001$		$\text{eta}^2=0.290$	

TABLE 14-41

Cost of Services by Patterns of Care of Breast Lump Episodes

Pattern	Definition of Pattern of Care
1	Biopsy
2	No biopsy, 3 or more contacts
3	No biopsy, 2 or less contacts, surgeon in episode
4	No biopsy, 2 or less contacts, no surgeon in episode

Pattern	N	Average Total Cost ($)	SD	SE	Average Medical Cost ($)	SD	SE	Average Lab/Rad. Cost ($)	SD	SE
1	24	125.51	44.92	9.17	108.21	40.48	8.26	17.30	10.28	2.10
2	36	49.61	38.99	6.50	36.71	34.29	5.72	12.90	11.50	1.92
3	58	21.81	21.92	2.88	16.22	18.75	2.46	5.59	9.29	1.22
4	63	6.59	7.98	1.01	2.85	4.09	0.52	3.74	6.70	0.84
Total	181	35.79	27.20	2.02	27.84	23.76	1.77	7.95	9.13	0.68
		$p<0.001$	$\text{eta}^2=0.669$		$p<0.001$	$\text{eta}^2=0.672$		$p<0.001$	$\text{eta}^2=0.230$	

TABLE 14-42

Patterns of Care (AID) for Breast Lump by Characteristics of the Patient

	Pattern of Care (AID)				
Age	1	2	3	4	Total
<30	7 (10.6%)	13 (19.7%)	22 (33.3%)	24 (36.4%)	66 (100.0%)
30-49	12 (14.8)	19 (23.5)	22 (27.2)	28 (34.6)	81 (100.0)
50+	5 (14.7)	4 (11.8)	14 (41.2)	11 (32.4)	34 (100.0)
Total	24 (13.3)	36 (19.9)	58 (32.0)	63 (34.8)	181 (100.0)
	p=0.700				
Index Diagnosis					
Benign Neoplasm	1 (2.9)	10 (28.6)	13 (37.1)	11 (31.4)	35 (100.0)
Unspecified Neoplasm	8 (20.0)	6 (15.0)	13 (32.5)	13 (32.5)	40 (100.0)
Mass	15 (14.2)	20 (18.9)	32 (30.2)	39 (36.8)	106 (100.0)
Total	24 (13.3)	36 (19.9)	58 (32.0)	63 (34.8)	181 (100.0)
	p=0.335				
Morbidity Status at Index					
Presenting	19 (17.0)	21 (18.8)	48 (42.9)	24 (21.4)	112 (100.0)
Associated	5 (7.2)	15 (21.7)	10 (14.5)	39 (56.5)	69 (100.0)
Total	24 (13.3)	36 (19.9)	58 (32.0)	63 (34.8)	181 (100.0)
	p<0.001				
Year					
1966-68	3 (8.6)	10 (28.6)	9 (25.7)	13 (37.1)	35 (100.0)
1969-70	5 (10.0)	6 (12.0)	20 (40.0)	19 (38.0)	50 (100.0)
1971-72	9 (18.4)	9 (18.4)	14 (28.6)	17 (34.7)	49 (100.0)
1973	7 (14.9)	11 (23.4)	15 (31.9)	14 (29.8)	47 (100.0)
Total	24 (13.3)	36 (19.9)	58 (32.0)	63 (34.8)	181 (100.0)
	p=0.592				
MD Specialty at Index Contact					
Internal Medicine	3 (4.5)	13 (19.7)	7 (10.6)	43 (65.2)	66 (100.0)
Obstetrics/Gynecology	4 (15.4)	2 (7.7)	3 (11.5)	17 (65.4)	26 (100.0)
Surgery	17 (20.0)	20 (23.5)	48 (56.5)	0 (0.0)	85 (100.0)
Miscellaneous	0 (0.0)	1 (25.0)	0 (0.0)	3 (75.0)	4 (100.0)
Total	24 (13.3)	36 (19.9)	58 (32.0)	63 (34.8)	181 (100.0)
	p<0.001				
Updated Morbidity					
Breast Cancer	5 (41.7)	3 (25.0)	3 (25.0)	1 (8.3)	12 (100.0)
Benign Neoplasm	5 (13.9)	10 (27.8)	12 (33.3)	9 (25.0)	36 (100.0)
Unspecified Neoplasm	3 (13.6)	4 (18.2)	11 (50.0)	4 (18.2)	22 (100.0)
Chronic Cystic	5 (14.3)	4 (11.4)	10 (28.6)	16 (45.7)	35 (100.0)
Mass	2 (3.2)	14 (22.6)	18 (29.0)	28 (45.2)	62 (100.0)
Other	4 (28.6)	1 (7.1)	4 (28.6)	5 (35.7)	14 (100.0)
Total	24 (13.3)	36 (19.9)	58 (32.0)	63 (34.8)	181 (100.0)
	p=0.014				

TABLE 14-43

Total Cost of Breast Lump Episodes by Combinations of Services

Combination of Services					
Biopsy	# Contacts	Surgeon in Episode	N	Average Cost ($)	SD
Yes	4+	yes	13	143.38	55.07
Yes	2-3	yes	8	106.03	10.31
Yes	1	yes	3	100.03	8.38
No	4+	yes	24	51.61	40.86
No	2-3	yes	37	34.39	28.37
No	1	yes	32	16.66	20.32
No	2-3	no	10	10.00	8.06
No	1	no	54	5.95	7.81
Total			181	35.79	46.91

$p<0.001$ $eta^2=0.694$

TABLE 14-44

Cost of Laboratory and Radiology Services for Breast Lump by Combinations of Services

Combination of Services				
Mammography	# Contacts	N	Average Cost ($)	SD
Yes	4+	15	26.00	11.99
Yes	1	12	16.98	4.47
Yes	2-3	24	16.61	7.68
No	4+	22	7.32	7.64
No	2-3	31	7.06	7.91
No	1	77	0.86	3.52
Total		181	7.95	10.33

$p<0.001$ $eta^2=0.603$

TABLE 14-45

Cost of Laboratory and Radiology Services by Combination of Services for Episodes of Breast Lump

Combination of Services				
Mammography	# Contacts	N	Average Lab and Radiology Cost ($)	SD
Yes	4+	15	26.00	11.99
Yes	1	12	16.98	4.47
Yes	2-3	24	16.61	7.68
No	4+	22	7.32	7.64
No	2-3	31	7.06	7.91
No	1	77	0.86	3.52
Total		181	7.95	10.33

$p<0.000$ $eta^2=0.603$

FIGURE 14-1

AID Analysis of All Episodes of Breast Lump, Utilization Variables

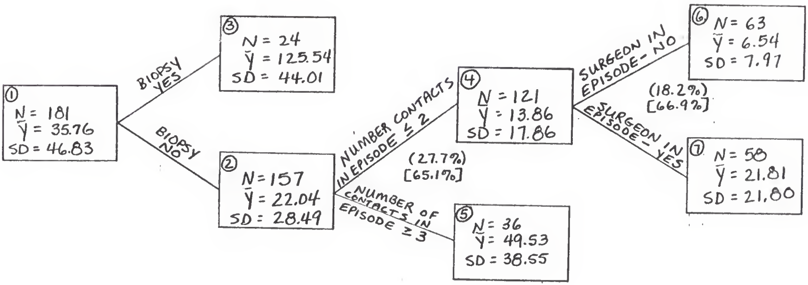

① N = 181 Ȳ = 35.76 SD = 46.83
BIOPSY YES
③ N = 24 Ȳ = 125.54 SD = 44.01
BIOPSY NO
② N = 157 Ȳ = 22.04 SD = 28.49
NUMBER CONTACTS IN EPISODE ≤ 2
(27.7%) [65.1%]
NUMBER OF CONTACTS IN EPISODE ≥ 3
④ N = 121 Ȳ = 13.86 SD = 17.86
⑤ N = 36 Ȳ = 49.53 SD = 38.55
SURGEON IN EPISODE - NO
⑥ N = 63 Ȳ = 6.54 SD = 7.97
(18.2%) [66.9%]
SURGEON IN EPISODE - YES
⑦ N = 58 Ȳ = 21.81 SD = 21.80

FIGURE 14-2

AID Analysis for Breast Lump Episodes with Two or More Contacts

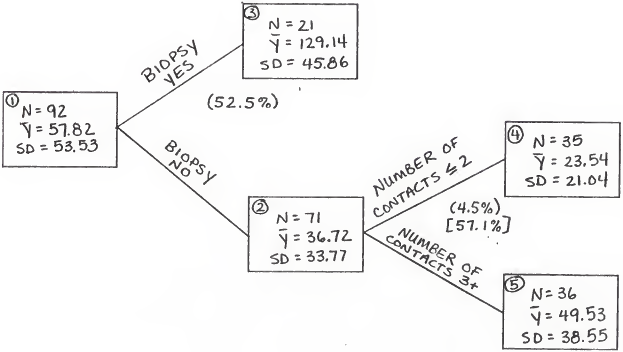


FIGURE 14-3

AID Analysis for Breast Lump Episodes with One Contact Only

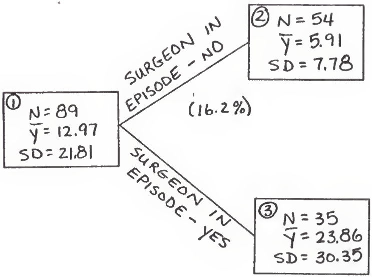
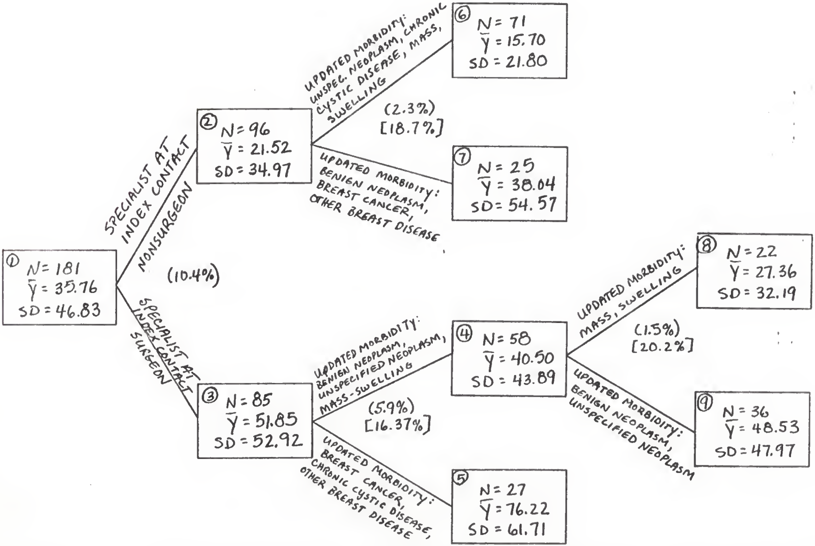


FIGURE 14-4

Analysis of Patient-System Variables for Breast Lump Episodes


① N = 181 Ȳ = 35.76 SD = 46.83
SPECIALIST AT INDEX CONTACT NONSURGEON
(10.4%)
SPECIALIST AT INDEX CONTACT SURGEON
② N = 96 Ȳ = 21.52 SD = 34.97
UPDATED MORBIDITY: UNSPEC. NEOPLASM, CHRONIC CYSTIC DISEASE, MASS, SWELLING
(2.3%)
[18.7%]
UPDATED MORBIDITY: BENIGN NEOPLASM, BREAST CANCER, OTHER BREAST DISEASE
⑥ N = 71 Ȳ = 15.70 SD = 21.80
⑦ N = 25 Ȳ = 38.04 SD = 54.57
③ N = 85 Ȳ = 51.85 SD = 52.92
UPDATED MORBIDITY: BENIGN NEOPLASM, UNSPECIFIED NEOPLASM, MASS-SWELLING
(5.9%)
[16.37%]
UPDATED MORBIDITY: BREAST CANCER, CHRONIC CYSTIC DISEASE, OTHER BREAST DISEASE
④ N = 58 Ȳ = 40.50 SD = 43.89
⑤ N = 27 Ȳ = 76.22 SD = 61.71
UPDATED MORBIDITY: MASS, SWELLING
(1.5%)
[20.2%]
UPDATED MORBIDITY: BENIGN NEOPLASM, UNSPECIFIED NEOPLASM
⑧ N = 22 Ȳ = 27.36 SD = 32.19
⑨ N = 36 Ȳ = 48.53 SD = 47.97

SECTION XV. SHOULDER BURSITIS

Rhesa Lee Penn with Herman M. Frankel, M.D.

ABSTRACT

Episodes of shoulder bursitis consisted of all contacts of patients 18 years of age or older where shoulder bursitis was the updated diagnosis. Shoulder bursitis was analyzed as an acute disease; 31 percent of bursitis patients had one or more recurrences following the initial bursitis episode. Each episode, whether the first or a recurrent episode, was examined separately.

There were 630 episodes of shoulder bursitis and 87 percent had resource use charged to them. The mean number of contacts per episode was 2.5, primarily office contacts. The mean cost per episode was $21.04; most costs were due to office visits, parenteral therapy, and physical therapy. Nearly 60 percent of episodes involved only one day of care, while 18 percent had episodes lasting a month or more.

Five different bundles of care were defined for the 630 bursitis episodes, with mean costs per episode in the treatment bundles ranging from $2.49 to $228.64. The choice among the bundles of care explained 53.1 percent of cost variation. Most of this cost variation was explained by whether or not the episode included eight or more physical therapy treatments. The costlier bundles of care included many physical therapy procedures, and parenteral therapy. Medium cost bundles included only parenteral therapy, while episodes receiving low cost bundles of care were single contacts with

neither parenteral nor physical therapy. The number of office visits, radiology procedures, and drugs ordered increased with the bundle cost.

Higher costs occurred in episodes in which bursitis was the primary reason for the initial contact, where arthritis or other skeletal disease was a comorbidity, and when the initial contact was an unscheduled walk-in apointment or a visit to the hospital emergency room. Costs were higher in episodes with surgeon, orthopedist, or consultant contacts.

It appears that high cost shoulder bursitis episodes were associated with greater disease severity. The specialty of the provider appeared to be less important than patient and disease characteristics in determining episode costs.

I. DISEASE DESCRIPTION AND EPISODE DEFINITION

This report summarizes the findings for episodes of shoulder bursitis. It is based on the computerized medical records of a 5 percent sample of all subscriber units in the KPMCP between September 30, 1966 and December 31, 1973.

Shoulder bursitis may develop in the presence of preexisting degeneration and calcium deposits in the tendons which run along the floor of the normally smooth-walled subdeltoid bursa. Under these conditions, a relatively mild injury to the shoulder, such as sprain or unaccustomed overuse, may trigger an acute inflammation, shoulder bursitis. Pain, the most prominent symptom, can be severe and may radiate from the shoulder area into the neck and upper arm. Motion usually makes the pain worse, and the affected shoulder is characteristically held in a rigid position. Muscle spasm and tenderness of the front and side of the shoulder are commonly present.

Textbook guidelines for care of shoulder bursitis have changed little over the last 30 years. The treatment is influenced by the severity and duration of symptoms.[1] Cold compresses and rest usually hasten the relief of pain and inflammation; anti-inflammatory or analgesic medication may be given. In most patients, there is a spontaneous remission of pain. When symptoms are very severe or persistent, dramatic relief may be obtained by inserting a large bore needle, under local anesthesia, into the area of the calcium deposit, and allowing the calcium flakes to exude into the overlying bursa. Some of the calcified material may be withdrawn during the same procedure, and an adrenocorticosteroid preparation may be injected. This needling, aspiration, and injection procedure is referred to in this report as parenteral therapy.

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[1] Christian CL. The painful shoulder. In Beeson PB, McDermott W, Wyngarden TB, eds. Textbook of Medicine. 15th ed. Philadelphia: WB Saunders, 1979, 206.

> The prospects of more chronic disability can be minimized by the institution of an active exercise program as soon as the level of discomfort permits. If the patient is not making progress toward regaining normal shoulder motion with a home exercise program, supervised therapy in a physical medicine department is important.[2]

As long as circulation to the area is not too greatly impaired, the calcium deposits remain reversible. Often, fairly large masses of calcium in tendons and in bursal walls disappear with rest and proper therapy.[3]

A small percentage of patients with refractory pain and persistent roentgenographic (x-ray) findings may require surgical exploration for removal of calcific deposits.

The analysis file included all medical care contacts for persons 18 years of age or older where the updated diagnosis was shoulder bursitis (741.1, International Classification of

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[2] Ibid.

[3] Aegester E, Kirkpatrick JA Jr. Orthopedic diseases: physiology, pathology, radiology. 4th ed. Philadelphia: WB Saunders, 1975, 681.

Diseases, Adapted [ICDA], 7th edition). An episode began with a patient's first contact with an updated diagnosis of shoulder bursitis, and ended with the last such contact prior to a period of 60 days or more during which there were no contacts with an updated diagnosis of shoulder bursitis. This definition of the end of the episode did not apply if this interval was followed by a contact or series of contacts explicitly noted in the medical record as a continuation of the episode of care.

This procedure resulted in the identification of 630 episodes of care of shoulder bursitis. Episodes of bursitis reflected periods of care, since the condition may have begun before the patient's index contact, the first contact for that condition within the Health Plan. The final contact was the last recorded contact for care within the study period, although the condition may have persisted beyond that contact.

The shoulder bursitis diagnosis code, 741.1, included such other afflictions of the shoulder as bicipital tenosynovitis, and included chronic as well as acute conditions. However, review of medical records documenting episodes with ten or more contacts - those most likely to involve conditions other than shoulder bursitis - indicated that virtually all of the 630 episodes were shoulder bursitis.

II. DESCRIPTION OF THE 630 EPISODES OF SHOULDER BURSITIS

A. Patient Characteristics

A comorbidity is any condition other than shoulder bursitis that was present and noted at the time of any shoulder bursitis. A majority of patients, 55.9 percent, had no diseases coexisting with shoulder bursitis (Table 15-1). Trauma was present in 29.2 percent of episodes, and 7.9 percent of episodes had arthritis or other nonbursitis musculoskeletal diseases.

Shoulder bursitis was the primary reason for the initial contact in 76.2 percent of the episodes (Table 15-2). In 18.6 percent of episodes, shoulder bursitis was not the presenting morbidity at any contact, while shoulder bursitis was the presenting morbidity at every contact in 70 percent of the episodes.

At the index contact, 53 percent of episodes had no symptoms recorded, while 44 percent had symptoms recorded that are characteristic of shoulder bursitis, alone or in combination with other musculoskeletal symptoms (Table 15-3). The mean duration of symptoms was 22 days (SE 5 days) for the 20.5% of episodes in which symptom duration was ascertained.

The diagnosis of shoulder bursitis was established at the index contact in 88.3 percent of episodes (Table 15-4). In 5.6 percent of episodes, the bursitis diagnosis was never noted as established.

In 69.5 percent of episodes, the first contact marked the start of a new episode. The remaining 30.5 percent were the continuing episodes; either the patient had had shoulder bursitis diagnosed within the Health Plan before the start of the data system, or there was information in the medical record indicating that the problem had previously existed.

The mean patient age at the index contact was 50.0 years (Table 15-5). Few patients were under 24 or over 75 years of age. Nearly 52 percent were females.

Patients had as many as eight shoulder bursitis episode noted during the study period (Table 15-6). In 31.4 percent of episodes, a recurrence of shoulder bursitis followed the episode.

Single day episodes of care comprised 59.4 percent of all shoulder bursitis episodes (Table 15-7). Eighteen percent of the episodes were one month or longer in duration. The mean episode duration was 17 days. There was no relationship between episode duration and the year of the index contact.

B. Provider Characteristics

The majority of episodes, 67.9 percent, had the index contact with an internist (Table 15-8). An orthopedist contact began 10.8 percent of episodes while 15.1 percent began with a surgeon or emergency care surgeon contact. In 62.4 percent of episodes, the provider of care at the first contact was the patient's regular attending physician (Table 15-9).

Most episodes, 96 percent, had at least one contact with a physician (Table 15-10). The mean number of physician contacts was 1.8, and 4.8 percent of episodes had five or more physician contacts. In 14.9 percent of episodes, there was at least one contact with a nonphysician; most of these were with physical therapists and physician assistants. The mean number of nonphysician contacts per episode was 0.7, with a maximum of 46.

In 6.7 percent of episodes, there was at least one contact with a consultant physician. Ninety percent of these episodes had multiple contacts.

Over the entire episode, internists accounted for 51 percent of all contacts (Table 15-11). Orthopedist contacts were present in 19.7 percent of episodes, and surgeon contacts were present in 13 percent of episodes. In 58.6 percent of episodes, there were only internist contacts; 10 percent had only orthopedist contacts; 11 percent had only surgeon or emergency care surgeon contacts. In 13.8 percent of episodes, there was a surgeon, emergency care surgeon, or orthopedist contact in combination with other types of contacts.

C. Medical Care Process Characteristics

Patients were eligible for Health Plan coverage at all contacts in 99.4 percent of episodes.

In 92.5 percent of episodes, the index contact was during regular medical office hours. There was at least one contact outside of regular medical office hours in 10.3 percent of episodes. Among these 67 episodes, 40.3 percent included only contacts outside regular hours.

At the index contact, 35.6 percent of the episodes were requested to return for further care (Table 15-12). Most commonly, the patient was instructed to return to radiology (19.2 percent). Nearly fifteen percent of episodes were instructed to return to a physician. Of the 224 episodes that received at least one request to return for further care of shoulder bursitis, 42 percent failed to return.

D. Utilization of Services

The mean number of contacts per episode was 2.5, with a range from one to 47 (Table 15-13). Included in this total were hospitalizations, regularly scheduled and walk-in medical office visits, emergency room visits, telephone calls or letters to or from the patient, and a small "other" category. These contacts were counted if shoulder bursitis was either the presenting morbidity (the primary reason for the contact) or an associated morbidity (a finding made during a contact for another condition). Three episodes included hospital admissions.

Fifty-six percent of episodes included at least one regularly scheduled medical office visit (Table 15-13). The mean number of such visits per episode was 1.4, with a maximum of 46. Overall, regularly scheduled medical office contacts were 56 percent of total contacts. In 33.2 percent of episodes, all contacts were regularly scheduled medical office contacts (Table 15-14).

The initial contact was a walk-in medical office visit in 43.0 percent of episodes (Table 15-15), and 51.1 percent of episodes included at least one walk-in office contact (Table 15-13). The mean number of walk-in contacts per episode was 0.7, with a maximum of seven contacts. Walk-in medical office contacts were 28 percent of all contacts; 28.3 percent of episodes included only walk-in medical office contacts (Table 15-14).

The medical office was the site of the index contact in 85.4 percent of the episodes (Table 15-15), and 91.3 percent of all episodes had at least one medical office contact (Table 15-13). The mean number of medical office contacts per episode was 2.1, with a maximum of 47. Medical office contacts were 84 percent of all contacts; 71.7 percent of episodes consisted solely of medical office contacts (Table 15-14).

An emergency room contact was the initial contact in 6.3 percent of episodes (Table 15-15), and 8.4 percent of episodes included at least one emergency room contact (Table 15-13). The emergency room was the site of four percent of all contacts, and 3.3 percent of episodes consisted solely of emergency rooom contacts (Table 15-14).

In 8.1 percent of episodes, the initial contact was a telephone call or letter (Table 15-15), and 21.8 percent of episodes included such contacts (Table 15-13). Telephone calls and letters were 12 percent of all episode contacts, and

4.4 percent of episodes consisted solely of letter or telephone contacts (Table 15-14).

There was one physical examination in 14 percent of episodes, and two physical examinations in one percent of episodes. Of the 94 episodes with physical examinations, 64.9 percent consisted solely of physical examinations. That is, shoulder bursitis was noted only at the time of a routine physical examination.

Most episodes, 75.7 percent, had at least one initial or follow-up medical office or emergency room visit at which shoulder bursitis was the presenting morbidity, causing the cost of the visit to be charged to shoulder bursitis (Table 15-16). The mean number of such visits per episode was 1.2, with a maximum of 18. In 50.9 percent of episodes, there was a single office visit charged to bursitis; in 14.9 percent, there were two such visits; ten percent had three or more office visits charged to shoulder bursitis.

In 39.7 percent of episodes, there was at least one parenteral therapy procedure given; the maximum number of these procedures per episode was 10 (Table 15-17). Of those who received parenteral therapy, 80 percent received this treatment once.

Physical therapy was given in 9.8 percent of shoulder bursitis episodes (Table 15-18). The 62 episodes with physical therapy received a mean of 14.1 procedures per episode (S.E. 3.1). The maximum number of physical therapy procedures in an episode was 181. Ultrasound and active or passive exercise were the most common types of physical therapy. The most common combinations of physical therapy procedures were: 12 episodes with sling application only; seven episodes with ultrasound only; five episodes with ultrasound and active/passive exercise only; and four episodes with massage, ultrasound, and hot/cold packs.

Neither parenteral therapy nor physical therapy was given in 55.9 percent of episodes (Table 15-19). Parenteral therapy alone was given to 34.3 percent of episodes; physical therapy alone was given to 4.4 percent of episodes; 5.4 percent of episodes received both physical and parenteral therapy.

In 8.9 percent of episodes, there was at least one drug-related telephone call. These included requests for a prescription refill from the patient or pharmacist, denials of a refill request until the patient visited the physician, and patient calls to the physician during which symptoms were discussed and a prescription was ordered (Table 15-19).

Laboratory tests were given in 4.8 percent of episodes (Table 15-20). Radiology procedures, primarily shoulder x-rays, were given to 24.8 percent of episodes.

There was at least one drug order in 75.9 percent of episodes that began in 1972-1973 (Table 15-21). The mean number of drug orders per episode was 1.9, with a maximum of 17. The most common drug types were non-steroid anti-inflammatory drugs, in 40.6 percent of episodes; steroids, in 37.1 percent of episodes; and local anesthetics, in 28.6 percent of episodes. The most common patterns of drug orders were steroid or non-steroid anti-inflammatory drugs only, in 25.4 percent of episodes; no drugs in 24.1 percent of episodes; and anti-inflammatory drugs with local anesthetics, in 22.3 percent of episodes (Table 15-22).

Mean outpatient dollar costs (exclusive of drug costs) per shoulder bursitis episode were $21.04. The maximum cost of an episode was $1,011. In 13.2 percent of episodes, no costs were charged to shoulder bursitis; any office visits, diagnostic tests, and therapeutic procedures were charged to a coexisting morbidity which was the primary reason for the patient's contacts. Office visits accounted for 42 percent of costs, and other office procedures (primarily physical and parenteral therapy) accounted for 43 percent of costs.

E. Summary of Key Descriptive Findings

1. A majority of shoulder bursitis episodes, 55.9 percent, had no comorbidities; 29.2 percent had trauma; 7.9 percent had arthritis or other non-bursitis musculoskeletal diseases.

2. In 76.2 percent of episodes, shoulder bursitis was the primary reason for the initial contact; in 18.6 percent of episodes, shoulder bursitis was never the principal reason for any contact.

3. The mean patient age at the index contact was 50 years; 51.6 percent of episodes involved females. During the

study period, 31.[illegible] percent of shoulder bursitis episodes as defined here were followed by recurrent episodes.

4. Almost 60 percent of shoulder bursitis episodes the episode of care lasted a single day, while 18 percent lasted 31 days or more.

5. In 67.9 percent of episodes, the initial contact was with an internist, and 58.6 percent had only internist contacts. Orthopedist contacts were present in 19.7 percent of episodes, and surgeon or emergency care surgeon contacts were present in 13 percent of episodes. Contacts with non-physician providers, primarily physical therapists and physician assistants, were present in 14.9 percent of episodes.

6. At the index contact, 35.6 percent of episodes were requested to return for further care. Of these 224 episodes, 42 percent failed to return.

7. The mean number of contacts per episode was 2.5, with a maximum of 47. The mean number of medical office contacts per episode was 2.1; two-thirds of these were regularly scheduled appointments.

8. Parenteral therapy was given in 39.7 percent of episodes.

9. Physical therapy was given in 9.8 percent of episodes; those who received such treatment received a mean of 14.1 procedures per episode. Ultrasound, active or passive exercise, and sling application were the most common physical therapy procedures.

10. Radiology procedures, primarily shoulder x-rays, were given to 24.8 percent of episodes.

11. Drug orders were given in 75.9 percent of episodes beginning in 1972 or 1973. The mean number of drug orders per episode was 1.9. Anti-inflammatory drugs and local anesthetics were the most commonly ordered drug types.

12. The mean cost per episode, exclusive of drug and hospital costs, was $21.04. No costs were charged to 13.2 percent of episodes. Office visits, physical therapy, and parenteral therapy accounted for 85 percent of total costs.

III. BIVARIATE ANALYSIS OF EPISODES OF SHOULDER BURSITIS

This section examines how resource use, measured by dollar cost per episode, varied as a function of selected patient, provider, medical care process, and utilization variables.

A. Patient Characteristics

Patients with shoulder bursitis as the presenting morbidity at the index contact had significantly higher episode costs than those for whom bursitis was an associated morbidity (Table 15-24). Patients with arthritis or other non-bursitis musculoskeletal disorders had significantly higher costs than those without such comorbidities (Table 15-25). No other disease characteristics had significant effects on costs: the presence of obesity, trauma, bursitis of sites other than the shoulder, non-bursitis musculoskeletal symptoms, or mental illness; the absence of comorbidities; index contact symptoms; whether the given episode was the patient's first or a recurrence; whether the diagnosis was established at the index contact or at any point in the episode; whether the episode was followed by a recurrence of shoulder bursitis; whether or not bursitis was the presenting morbidity at every contact in the episode.

Episode costs increased with increasing duration (Table 15-26). Mean costs ranged from $8.36 for single-day episodes to $127.70 for episodes lasting 91 days or more. Patient sex, age, and the year of the initial contact were not significantly related to cost.

B. Provider Characteristics

Episodes with surgeon or emergency care surgeon contacts at the index contact had significantly higher costs than other episodes (Table 15-27). Among multiple contact episodes, costs were significantly higher for those with orthopedist, surgeon, physical therapist, or consultant contacts (Table 15-28). Excluding interaction effects, the presence or absence of a physical therapist contact explained 27 percent of the variation in episode cost for multiplecontact episodes. The provider status at the index contact, and the presence or absence of a physician provider at the index contact did not have significant effect on cost.

C. Medical Care Process Characteristics

Episodes in which the patient was requested at the index contact to return for a consultant visit, radiology, or physical therapy had significantly higher costs than episodes without such return requests (Table 15-29). Patient eligibility for Health Plan coverage and the presence of contacts outside regular medical office hours were not significantly related to episode costs.

D. Utilization of Services

Episodes which began with walk-in or emergency room visits had higher costs than those which began with a regularly scheduled medical office visit; both types of episode were costlier than those which began with a letter or telephone call (Table 15-30).

Episodes with physical and parenteral therapy had a mean cost of $136.24, and those with only physical therapy had a mean cost of $58.02 (Table 15-31). Episodes with only parenteral therapy had a mean cost of $18.01, while episodes with neither physical nor parenteral therapy had a mean cost of $8.83. Excluding interaction effects, these combinations of office procedures explained 32 percent of variation in episode costs. Episodes with narcotic analgesics, steroids, nonsteroid anti-inflammatory drugs, or local anesthetics had significantly higher costs than episodes without these drug orders (Table 15-32). The pattern of drug orders associated with highest cost episodes was the ordering of analgesics, local anesthetics, and anti-inflammatory drugs; episodes without drug orders were associated with the lowest costs (Table 15-33). Major contributions to episode cost variation were made by the number of physical therapy procedures (ETA^2=.95), the number of office visits (ETA^2=.24), and the number of drug orders (ETA2=.21), as shown in Table 15-34.

E. Summary of Key Bivariate Findings

1. Costs were higher for episodes with arthritis or other non-bursitis musculoskeletal diseases as a comorbidity, for those with bursitis as the primary reason for the initial contact, and for those with longer duration episodes. No other patient characteristics, including age, sex, and symptoms had a significant relationship to episode costs.

2. Higher costs were associated with episodes that had a surgeon or emergency care surgeon as the provider at the index contact. Among multiple-contact episodes, costs were higher for those with any consultant, orthopedist surgeon, or physical therapist contacts.

3. Episodes which began with an emergency room or walk-in medical office contact had higher costs than others. Drug orders associated with significantly higher episode costs were narcotic analgesics, local anesthetics, and steroid or non-steroid anti-inflammatory drugs. Virtually all of the variation in costs was associated with variation in the number of physical therapy procedures.

IV. MULTIVARIATE ANALYSIS

A. Automatic Interaction Detection (AID)

This technique, described in Section IV, was used to identify the combinations of office visits, laboratory and radiology procedures, telephone calls, physical or parenteral therapy and other services which best accounted for variation in episode costs. This procedure was also used to define the combinations of patient, provider, and medical care process characteristics which best accounted for the variation in costs of episodes of shoulder bursitis.

1. Utilization

The dependent variable was total outpatient costs per episode, excluding drug costs. The first analysis was of all 630 episodes; predictor variables are shown in Table 15-35, and results are in Figure 15-1. Overall, predictor variables explained 53.1 percent of cost variation; 50.4 percent of overall cost variation was due to the presence of eight or more physical therapy procedures in the episode. Only 2.7 percent of of cost variation was explained by the number of office visits charged to bursitis. Five bundles of care were defined. The lowest cost bundle of care, at a mean cost of $2.49 per episode (S.E. $0.37) included 151 episodes with fewer than seven physical therapy procedures and no office visits charged to bursitis. The highest cost bundle of care, at a mean cost of $228.64 per episode (S.E. $50.30) included 17 episodes with 18 or more physical therapy procedures per episode. This analysis showed an extreme range of costs of bundles of care in treating shoulder bursitis.

Figure 15-2 shows the results of an AID analysis of the variables in Table 15-35, examining only the 598 episodes with seven or fewer physical therapy procedures. These were examined separately because of the possibility that the very high-cost bursitis episodes requiring eight or more physical therapy procedures obscured factors which affected the relative cost of the less expensive but more common episodes with seven or fewer physical therapy contacts. Figure 15-2 shows that the utilization variables explained 67 percent of the variation in episode costs. The number of office visits explained 55.2 percent of cost variation, and the presence or absence of shoulder x-rays, parenteral or physical therapy, or other procedures explained another 11.8 percent of cost variation. Nine bundles of care were defined. The lowest cost bundle of care included 83 episodes with no costs charged to the care of shoulder bursitis. The highest cost bundle of care (mean cost of $46.50 per episode) included 22 episodes with three or more office visits and one or more shoulder x-rays charged to bursitis.

2. Analysis of Patient, Provider, and Medical Care Process Characteristics

This analysis used total outpatient dollar cost per episode (exclusive of drug costs) as the dependent variable, and shows the influence of different patient, provider, and medical care process variables upon episode costs. Variables used are shown in Table 15-36, and included those which had a significance level of .20 or lower from the bivariate analysis of episode costs. Episode duration, however, was not included.

Figure 15-3 shows that patient, provider, and medical care process variables explained nine percent of cost variation among the 630 episodes of bursitis. Higher episode costs were associated with the presence of a surgeon or orthopedist contact, with new episodes of bursitis, and with episodes in which bursitis was the presenting morbidity at the index contact. The costliest episodes were those with surgeon and orthopedist contacts.

Figure 15-4 shows that the patient, provider, and medical care process variables explained 30.8 percent of the variation in costs among the 598 episodes with seven or fewer physical therapy procedures. The most important variable, which explained 15.6 percent of cost variation, was whether shoulder bursitis was the presenting morbidity at the index contact (the primary reason for the contact). The remaining 15.2 percent of cost variation was explained by the presence or absence of orthopedist or surgeon contacts, by patient sex, and by whether the episode was new or continuing. The costliest episodes were new episodes with bursitis as the presenting morbidity at the index contact and with orthopedist contacts. This group included 43 episodes with a mean cost of $30.51 (S.E. $3.74). The lowest cost episodes included 123 episodes with bursitis as an associated morbidity at the index contact, and without orthopedist contacts. For this group, the mean cost was $3.59 (S.E. $0.74).

3. AID Summary

For all 630 episodes of bursitis, most of the variation in the costs of episodes that was accounted for was due to the extreme variation in the number of physical therapy procedures ordered. Utilization variables explained 53.1 percent of cost variation. Five bundles of care were identified, consisting of combinations of physical therapy procedures and office visits. Very little of the cost variation in episode costs was explained by patient, provider or medical care process variables. For this reason, the log-linear multiple classification analysis, which would relate the choice of bundle of care to interactions of patient, provider, and medical care process variables was not performed for this condition.

For the 598 episodes with seven or fewer physical therapy procedures, nine bundles of care were defined which explained 67 percent of cost variation. Most of the variation in episode costs that was accounted for was due to variation in the number of office visits. The range in bundle costs was considerably smaller than the cost variation for all 630 episodes. Patient, provider, and medical care process variables - primarily the presence or absence of orthopedist or surgeon contacts, patient sex, and the presenting morbidity status of bursitis at the initial contact - explained 31.6 percent of the variation in episode costs.

B. Description of 630 Shoulder Bursitis Episode Using Five Bundles of Care

1. Utilization of Services

All episodes with eight or more physical therapy procedures had four or more contacts in the medical office Table 15-37). The majority of episodes, 52.3 percent, which received the third bundle of care - two or more office visits with seven or fewer physical therapy procedures - had two medical office contacts (Table 15-37). The majority of episodes receiving the two lowest cost bundles of care - none or one office visit for bursitis as the presenting morbidity - had a single medical office contact.

Most episodes with eight or more physical therapy contacts also received parenteral therapy (Table 15-38). The majority of episodes receiving the third bundle of care were given parenteral therapy without physical therapy. Most episodes which received the two lowest cost bundles of care received neither physical therapy nor parenteral therapy.

The mean number of medical office contacts, parenteral therapy procedures, and physical therapy procedures per episode increased with increasing bundle costs (Table 15-39). The mean numbers of radiology procedures per episode were similar in the two highest cost bundles of care, while the numbers of drug orders per episode were similar for the three more costly bundles of care.

The frequency of drug orders and instructions to the patient to return for further care after the index contact, increased among episodes with higher bundle costs

(Table 15-40). Episodes receiving the two most costly bundles were similar in the frequency of laboratory tests and shoulder x-rays; these procedures were less frequent for episodes receiving the three lower cost bundles of care. Episodes receiving the three costliest bundles of care had a similar frequency of parenteral therapy. No rib, upper arm, or upper back x-rays were given to episodes receiving the costliest bundle of care. The frequency of walk-in or hospital emergency room index contacts was similar among episodes receiving the second, third, and fourth bundles of care, and above the frequency of such contacts for those receiving either the highest cost or the lowest cost bundles of care. A physical examination at the initial contact was most frequent for episodes receiving the lowest cost bundle of care.

Among episodes receiving the three costliest bundles of care, approximately 20 percent received tranquilizers and 40 percent received local anesthetics (Tables 15-41). At least 70 percent of the episodes receiving the four most costly bundles of care received an anti-inflammatory medication. No episodes which received the costliest bundle of care received analgesic orders.

Single contact episodes were 77.7 percent of those receiving the fourth bundle of care, and 83.4 percent of those receiving the fifth, lowest cost bundle of care.

episodes receiving the lowest cost bundle of care were as likely to have comorbidities as those receiving the highest cost bundle of care. The proportion of episodes of bursitis which were the patient's second through eighth episode within the Health Plan was highest for those receiving the highest cost and the lowest cost bundles of care.

The proportion of episodes with orthopedist, consultant, or surgeon/emergency surgeon contacts increased with the cost of the bundle of care, as did the proportion of episodes with a surgeon or emergency care surgeon as the index contact provider (Table 15-44). The proportion of episodes with an orthopedist at the index contact was not related to variations in bundle costs. Episodes receiving the highest cost bundle of care were least likely to begin the episode with an internist contact; those receiving the lowest cost bundle of care were most likely to begin the episode with an internist contact.

3. Summary of Analysis of Bundles of Care

AID analysis of the 630 episodes of shoulder bursitis defined five different bundles of care. These bundles represented different patterns of care for this condition, not merely the provision of different amounts of the same type of service. The two highest cost bundles included episodes with parenteral therapy and many physical therapy procedures; the middle cost bundle primarily included episodes with parenteral therapy only; the two lowest cost bundles generally included single contact episodes with neither parenteral nor physical therapy. Most measures of utilization - including contacts, diagnostic or therapeutic procedures, and drug orders - increased with the cost of the bundle of care.

Episodes receiving the lowest-cost bundle of care were likely to have one or more of these characteristics: no symptoms noted in the medical record, bursitis as a secondary reason for the initial contact, and an initial contact with an internist - often, as part of a physical examination. Episodes receiving the highest cost bundle of care were likely to have one or more of these characteristics: a long mean duration, higher patient age at the index contact, a tentative or unknown index contact diagnosis, and at least one contact with an orthorpedist surgeon, or consultant. The frequency of recurrences after any given episode varied little with respect to the bundle of care. There was no clear linkage between bundle cost and the types of comorbiditie present.

V. CONCLUSION

A. Episode Definition

Shoulder bursitis was defined as an acute condition; patients had as many as eight episodes of this disease during the study period. All contacts with an updated diagnosis of shoulder bursitis were included in the episode.

There are several reasons to suspect that the episode definition did not identify a group of episodes of comparable severity and completeness. In 30.5 percent of episodes, the initial contact with an updated diagnosis of shoulder bursitis was considered to be part of an ongoing episode of bursitis. Also, in 5.6 percent of the 630 episodes, the diagnosis of shoulder bursitis remained tentative or unknown throughout the episode. Patients with shoulder bursitis as the primary reason for the initial contact were included with those for whom bursitis was not the primary reason for the initial contact.

The definition of bundles of care by AID analysis showed that 50.4 percent of the variation in cost was explained by the presence of eight or more physical therapy procedures in the episode. These 32 episodes had much larger mean costs and duration than other shoulder bursitis episodes. These episodes were substantively different from the shorter, lower cost episodes.

B. Bundles of Care

Outpatient dollar cost, exclusive of drug costs, was the measure of resource use measure for this condition. Five bundles of care were defined; the choice among them explained 53.8 percent of all variation in episode costs. The range of costs of bundles of care was from $2.49 for the 151 episodes receiving the lowest cost bundle to $228.64 for the 17 episodes receiving the costliest bundle. Most of this cost variation was due to differences in the number of physical therapy procedures.

The higher cost bundles of care included more office visits, radiology procedures, and drug orders than lower cost bundles of care. There was also a qualitative difference in the type of services given. The highest cost bundles included multiple physical therapy procedures. The medium cost bundle included several office visits with parenteral therapy, but usually without physical therapy. The lower cost bundles usually consisted of a single contact without parenteral or physical therapy. The rate of shoulder bursitis recurrence following each episode did not vary directly with the cost of the bundle of care, although those receiving the least costly bundle were least likely to have a subsequent shoulder bursitis episode.

C. Influence of Patient, Provider, and Medical Care Process Characteristics on Resource Use

These patient characteristics were associated with higher cost episodes: shoulder bursitis was the primary reason for the initial contact, and arthritis or other non-bursitis musculoskeletal disease were a comorbidity. Episodes with the initial contact in the hospital emergency room or as a walk-in medical office visit had higher costs than others; patients with enough distress to cause them to make an unscheduled visit for this condtion may have had more severe illness requiring more aggressive treatment. The presence of trauma or bursitis of sites other than the shoulder did not affect costs. The types of symptoms recorded at the index contact also did not affect costs. However, no information was available on the severity of symptoms or on whether symptoms persisted after the start of treatment. Severe or persistent symptoms could necessitate more intensive therapy.

Episodes which included orthopedist, surgeon, physical therapist, or consultant contact had higher costs than others; this may reflect physicians' tendency to refer those with severe or persistent shoulder bursitis to other sources of care. Those whose initial contact was with a surgeon or emergency care surgeon had higher episode costs. This may have been a result of surgeons' tendency to order costlier types of therapy, or it may have been that patients with severe bursitis were triaged to a surgeon at the initial contact.

It seems likely that high cost shoulder bursitis episodes were associated with disease of greater severity; further clinical data would be necessary to prove or disprove this assertion. The specialty of the provider appeared to be less important than patient and disease characteristics in determining episode costs.

TABLE 15-1

Frequency of Shoulder Bursitis Episodes with Comorbidities at One or More Contacts

Comorbidity	N	Pct.
No comorbidities	352	55.9
Comorbidities	278	44.1
	630	100.0
Including:* †		
1. Obesity	34	5.4
2. Trauma	184	29.2
3. Bursitis, other than shoulder bursitis	27	4.3
4. Drug adverse effects	3	0.5
5. Arthritis and other non-bursitis musculoskeletal disease	50	7.9
6. Psychiatric conditions	29	4.6
7. Musculoskeletal symptoms, other than for shoulder bursitis	34	5.4

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*Comorbidity groups denote these conditions (7th ICDA codes, as adapted by the HSRC):

1. Obesity: 287.0.
2. Trauma: 800.0-959.9, 996.1, 996.9, E825, E904, E915, E936, E979, 724.0-traumatic arthritis, fractures, dislocations, sprains, strains, bruises, cuts, burns, head injuries, other internal injuries, accidents, falls.
3. Bursitis, other than shoulder bursitis: 741.0, 741.2-741.9: bursitis of the spine, elbow, wrist, hand, finger, hip, knee, ankle, toe, foot, or unspecified sites.
4. Drug adverse effects: 586.2, 963.0-993.0, 996.2-999.5: drug jaundice, and adverse reactions to specific therapies.
5. Arthritis and other non-bursitis musculoskeletal disease: 720.0-723.2, 724.9-739.9 - arthritis, ankylosis, osteomyelitis, osteochondrosis.
6. Psychiatric conditions: 323.0-324.9: psychophysiologic reactions, anxiety, depression, and other neuroses.
7. Musculoskeletal symptoms, other than for shoulder bursitis: all symptom codes for bone, muscle, or joint pain, swelling, or limitation of motion, except pain, swelling, or limitation of motion for shoulder.

†These add up to more than 278, since some patients had several different types of comorbidities.

TABLE 15-2

Combinations of Comorbidities in Shoulder Bursitis Episodes

	N	Pct.
1. Bursitis was not the reason for index contact; no coexisting musculoskeletal disease*	121	19.2
2. Bursitis was not the reason for the index contact; other musculoskeletal disease present	29	4.6
3. Bursitis was the reason for the index contact; no coexisting musculoskeletal disease	459	72.9
4. Bursitis was the reason for the index contact; other musculoskeletal disease present	21	3.3
	630	100.0

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*Arthritis or other non-bursitis musculoskeletal disease, as defined in group 5 of Table 15-1.

TABLE 15-3

Symptoms at the Index Contact of Shoulder Bursitis Episodes

Symptoms*	N	Pct.
None recorded	334	53.0
Shoulder symptoms only	260	41.3
Other symptoms only	19	3.0
Shoulder bursitis and other symptoms	17	2.7
	630	100.0

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*Symptom codes denote:
-Shoulder bursitis symptoms - T771, shoulder pain; T775, shoulder limitation of motion; T781, arm or forearm pain.
-Other symptoms - other musculoskeletal symptoms.

TABLE 15-4

Status of the Shoulder Bursitis Diagnosis at the Episode Index Contact

	N	Pct.
Unknown	33	5.2
Tentative	41	6.5
Established	556	88.3
	630	100.0

TABLE 15-5

Patient Age at the Index Contact of Shoulder Bursitis Episodes

Age	N	Pct.
18-24	22	3.5
25-34	77	12.2
35-44	108	17.1
45-54	207	32.9
55-64	112	17.8
65-74	74	11.7
75 or more	30	4.8
	630	100.0

Mean: 50.0 years
S.E.: 0.6 years
Range: 18-86 years

TABLE 15-6

Shoulder Bursitis Episode Number

	N	Pct.
Patient's first episode	432	68.6
Patients second episode	124	19.7
Patient's third episode	39	6.2
Patient's fourth episode	19	3.0
Patient's fifth episode	9	1.4
Patient's sixth episode	4	0.6
Patient's seventh episode	2	0.3
Patient's eighth episode	1	0.2
	630	100.0

TABLE 15-7

Duration of Shoulder Bursitis Episodes

	N	Pct.
One day*	374	59.4
2-7 days	43	6.8
8-14 days	46	7.3
15-30 days	54	8.6
31-45 days	25	4.0
46-60 days	30	4.8
61-90 days	28	4.4
91 or more days	30	4.8
	630	100.0

Mean: 17 days
S.E.: 1.3 days
Range: 1-304 days

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*370 of these were single-contact episodes; 4 episodes included multiple contacts on a single day.

TABLE 15-8

Specialty of Provider at Index Contact of Shoulder Bursitis Episodes

	N	Pct.
Internal medicine	429	67.9
Orthopedist	68	10.8
Surgeon	54	8.6
Emergency care surgeon	41	6.5
New health practitioners*	34	5.4
Others**	5	0.8
	630	100.0

*Includes 33 physician assistant contacts and 1 pediatric nurse practitioner contact.

**Administrator and nurse contacts.

TABLE 15-9

Status of Provider at Index Contact of Shoulder Bursitis Episodes

	N	Pct.
Regular attending	393	62.4
Temporary attending	227	36.0
Consultant	6	1.0
Other*	4	0.6
	630	100.0

*Includes letters to administrators, and a telephone call to a nurse.

TABLE 15-10

Physician and Nonphysician Contacts During Episodes of Shoulder Bursitis

Number of Contacts	Episodes with Physician Contacts		Episodes with Nonphysician Contacts*	
	N	Pct.	N	Pct.
0	25	4.0	536	85.1
1	366	58.1	39	6.2
2	117	18.5	7	1.1
3	68	10.8	5	0.8
4	24	3.8	5	0.8
5	7	1.1	7	1.1
6-10	18	2.9	22	3.5
11 or more	5	0.8	9	1.4
	630	100.0	630	100.0
Mean	1.8		0.7	
S.E.	0.08		0.11	
Range	0-28		0-46	
Percent of all contacts	72.0%		28.0%	

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*Includes: 49 episodes with physical therapist contacts
3 episodes with registered nurse contacts
4 episodes with administrator contacts
1 episode with a nurse contact
40 episodes with physician assistant contacts

TABLE 15-11

Frequency of Provider Contacts by Specialty in Shoulder Bursitis Episodes

	Percent of Episodes with Given Number of Contacts						Maximum Number of Contacts	Proportion of All Contacts with the
Specialty	0	1	2	3	4	5 or more	Per Episode	Provider Specialty
Internist	29.2	46.2	14.0	5.9	0.6	4.1	47	51.0%
Orthopedist	80.3	11.9	3.2	0.8	0.6	3.2	24	23.0%
Surgeon	87.0	8.3	2.7	0.5	0.2	1.4	23	13.0%
Urologist	99.8	0.2	—	—	—	—	1	0.0%
New health practitioner*	93.2	5.6	0.5	0.2	0.6	—	4	4.0%
Emergency care surgeon	92.2	5.2	1.1	0.6	0.3	0.6	17	6.0%
Other specialties**	97.9	1.4	0.3	—	—	0.4	16	3.0%

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*Included 40 episodes with physician assistant contacts and 3 episodes with pediatric nurse practitioner contacts.

**Included 1 episode with physical therapy, department contacts, 6 with administrator contacts, 1 with an internist contact, and 2 with a physiatrist contact.

TABLE 15-12

Index Contact Instructions to Return for Further Care in Shoulder Bursitis Episodes

	N	Pct.
No instruction to return for further care	406	64.4
Any return instruction	224	35.6
	630	100.0
Including:*		
Return to physician**	93	14.8
Return to laboratory	21	3.3
Return to radiology	121	19.2
Return to physical therapy	19	3.0
Other return instructions***	18	2.9

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*These add up to more than 224; many patients were given more than one instruction to return.

**24 of these were instructed to return to a consultant physician.

***Includes 6 to nurse at injection room, 12 to follow up by telephone call, and 1 hospital admission.

TABLE 15-13

Place and Type of Contacts for Shoulder Bursitis Episodes

					Including Episodes With:							
Number of Contacts	All Contacts		Episodes with Contacts at Medical Office		Regularly Scheduled Medical Office Contacts		Walk-In Medical Office Contacts		Episodes with Hospital Emergency Room Contacts		Episodes with Telephone or Letter Contacts	
	N	Pct.	N	Pct.	N	Pct.	N	Pct.	N	Pct.	N	Pct.
0	0	0	55	8.7	277	44.0	308	48.9	577	91.6	493	78.2
1	370	58.7	380	60.3	243	38.6	257	40.8	51	8.0	100	15.9
2	115	18.3	103	16.3	50	7.9	45	7.1	1	0.2	18	2.8
3	59	9.4	30	4.8	10	1.6	12	1.9	1	0.2	8	1.3
4	22	3.5	8	1.3	7	1.1	3	0.5	—	—	3	0.5
5	9	1.4	7	1.1	6	1.0	2	0.3	—	—	5	0.8
6-10	31	4.9	25	4.0	21	3.3	3	0.5	—	—	3	0.5
or more	24	3.8	22	3.5	16	2.5	—	—	—	—	—	—
	630	100.0	630	100.0	630	100.0	630	100.0	630	100.0	630	100.0
Mean	2.5		2.1		1.4		0.7		0.1		0.3	
S.E.	0.16		0.14		0.13		0.04		0.01		0.03	
Range	1-47		0-47		0-46		0-7		0-3		0-7	
Percent of total contacts, all episodes	100%		84%		56%		28%		4%		12%	

TABLE 15-14

Distribution of Shoulder Bursitis Episode Contacts by Place of Service During the Episode

Contacts	Episodes With Medical Office Contacts		Includes Episodes With: Regularly Scheduled Medical Office Contacts		Includes Episodes With: Walk-in Medical Office Contacts		Episodes with Emergency Room Contacts		Episodes with Telephone or Letter Contacts	
	N	Pct.	N	Pct.	N	Pct.	N	Pct.	N	Pct.
None	55	8.7	277	44.0	308	48.9	577	91.6	493	78.3
Some	123	19.5	144	22.9	144	22.9	32	5.1	109	17.3
All	452	71.7	209	33.2	178	28.3	21	3.3	28*	4.4
	630	100.0	630	100.0	630	100.0	630	100.0	630	100.0

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25 of these episodes consisted solely of telephone contacts.

TABLE 15-15

Type of Appointment at the Index Contact for Shoulder Bursitis Episodes

	N	Pct.
Regularly scheduled medical office visit	267	42.4
Walk-in medical office visit	271	43.0
Hospital emergency room	40	6.3
Telephone or letter	51	8.1
Injection room	1	0.2
	630	100.0

TABLE 15-16

Frequency of Office Visits in Shoulder Bursitis Episodes, When Shoulder Bursitis is the Principal Reason for the Contact

Number of Initial or Follow-up Office Visits*	N	Pct.
0	153	24.3
1	320	50.9
2	94	14.9
3	36	5.7
4	11	1.7
5 or more	16	2.5
	630	100.0

Mean: 1.2
S.E.: 0.06
Range: 0-18

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*These visits could occur either in the medical office or in the hospital emergency room.

TABLE 15-17

Frequency of Parenteral Therapy in Episodes of Shoulder Bursitis

Number	N	Pct.
0	380	60.3
1	199	31.6
2	34	5.4
3	9	1.4
4	6	1.0
5 or more	2	0.3
	630	100.0

Mean: 0.5
S.E.: 0.03
Range: 0-10

TABLE 15-18

Frequency of Physical Therapy Procedures in Shoulder Bursitis Episodes

Procedure	Percent of Episodes with Given Number of Contacts 0	1	2	3 or more	Maximum Number of Procedures Per Episode	Cost Per Procedure
All physical therapy	90.2	2.4	0.3	7.1	181	\$3-\$6
Short wave	99.4	0	0	0.6	46	\$5
Massage	97.3	0.5	0.3	1.9	43	\$5
Ultrasound	94.3	1.0	0.3	4.4	20	\$5
Active and passive exercise	95.9	0.6	0.2	3.3	46	\$6
Exercise room, including vimulator	98.6	0.2	0.2	1.0	46	\$6
Iontophoresis	98.4	--	0.2	1.4	9	\$5
Hot or cold packs	97.9	0.3	0.3	1.5	16	\$5
Sling application	97.6	2.4	--	--	1	\$5
Wheel exercise	99.5	0.2	--	0.3	11	\$6
Other physical therapy*	99.2	0.6	0.2	--	2	\$3-\$6

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*Denotes: electric stimulation, bandage application, splint application, or total body relaxation group.

TABLE 15-19

Combinations of Procedures Used in Shoulder Bursitis Episodes

	N	Pct.
Neither parenteral nor physical therapy	352	55.9
Parenteral therapy	216	34.3
Physical therapy	28	4.4
Parenteral and physical therapy	34	5.4
	630	100.0

TABLE 15-20

Frequency of Laboratory and Radiology Procedures in Shoulder Bursitis Episodes

Procedure	Percent of Episodes with Given Number of Contacts 0	1	2	3	4	5 or more	Maximum Number Per Episode	Cost Per Test
Laboratory tests	95.2	2.7	1.0	0.3	0.2	0.6	6	$0.90-$4.50
Radiology procedures	75.2	20.3	3.7	0.5	0.3	—	4	$6-$15
Shoulder x-rays*	76.8	21.6	1.6	—	—	—	2	$6-$10.50
Other upper body x-rays**	97.5	2.2	0.3	—	—	—	2	$6-$15

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*Includes shoulder x-rays - 1, 2, 3 or more views; clavicle, 1 or 2 views, scapula, 1 or 2 views; bilateral study of acromolo-clavicular joints.

**Includes bilateral x-ray of ribs or thoracic spine or cervical spine or humerus.

TABLE 15-21

Frequency of Drug Orders in Shoulder Bursitis Episodes*

Type of Drug Ordered	Percent of Episodes with Given Number of Contacts 0	1	2	3 or more	Maximum Number of Drug Orders Per Episode
All drugs	24.1	25.9	21.0	29.0	17
Narcotic analgesics	84.4	12.9	1.3	1.3	7
Non-narcotic analgesics	93.8	5.8	0.4	--	2
Minor tranquilizers, skeletal muscle relaxants	89.7	8.9	1.3	--	2
Steroids	62.9	19.2	15.2	2.7	5
Local anesthetics	71.4	24.1	4.0	0.4	5
Non-steroid anti-inflammatory drugs	59.4	35.7	4.5	0.4	3
Other drugs**	93.8	5.4	0.9	--	2

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*Based on 224 episodes beginning in 1972-1973, the only years for which drug order information was available.

**Includes orders for antibiotics, antacids, immunization, skin tests, protectants, and undetermined drugs.

TABLE 15-22

Combinations of Drug Orders in Shoulder Bursitis Episodes*

	N	Pct.
No drugs	54	24.1
Analgesics only**	11	4.9
Anti-inflammatory drugs only***	57	25.4
Analgesics with anti-inflammatory drugs	24	10.7
Anti-inflammatory drugs with local anesthetics	50	22.3
Analgesics with anti-inflammatory drugs with local anesthetics	14	6.3
Other drugs only****	14	6.3
	224	100.0

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*Based on 224 episodes beginning in 1972-1973, the only years for which drug order data were available.

**Narcotic and non-narcotic analgesics.

***Steroid and non-steroid anti-inflammatory drugs.

****Includes 9 with tranquilizer/skeletal muscle relaxant orders, and others with miscellaneous drugs.

TABLE 15-23

Costs of Care for Shoulder Bursitis Episode

Dollars	Total Cost		Letter Cost		Office Visit Cost		Telephone Cost		Other Office Procedure Cost		Radiology Cost		Laboratory Cost	
	N	Pct.	N	Pct.	N	Pct.	N	Pct.	N	Pct.	N	Pct.	N	Pct.
0	83	13.2	606	96.2	152	24.1	528	83.8	352	55.9	474	75.2	600	95.2
1-10	230	36.5	22	3.5	350	55.6	102	16.2	226	35.8	128	20.3	29	4.6
11-20	182	28.9	2	0.3	100	15.8	—	—	8	1.3	24	3.8	1	0.2
21-30	59	9.4	—	—	18	2.9	—	—	8	1.3	3	0.5	—	—
31-40	29	4.6	—	—	5	0.8	—	—	3	0.5	1	0.2	—	—
41-50	6	0.9	—	—	2	0.3	—	—	4	0.6	—	—	—	—
51 or more	41	6.5	—	—	3	0.5	—	—	29	4.6	—	—	—	—
	630	100.0	630	100.0	630	100.0	630	100.0	630	100.0	630	100.0	630	100.0
Mean	$21.04		$0.21		$8.88		$0.32		$9.09		$2.31		$0.23	
S.E.	$2.06		$0.05		$0.34		$0.03		$1.92		$0.18		$0.05	
Range	$0-$1,011		$0-$13.50		$0-$112.50		$0-$7.50		$0-$1,001		$0-$36		$0-$15	
Percent of total dollar costs	100%		1%		42%		2%		43%		11%		1%	

TABLE 15-24

Mean Cost Per Shoulder Bursitis Episode, By Whether Bursitis was the Presenting or Associated Morbidity at the Index Contact

	Mean Cost	S.E.	N	F	P	ETA^2
Associated morbidity	\$13.29	\$3.53	150	4.4	.04	.01
Presenting morbidity	\$23.47	\$2.47	480			

TABLE 15-25

Mean Cost Per Shoulder Bursitis Episode, By the Presence or Absence of Arthritis or Other Non-Bursitis Musculoskeletal Diseases

	Mean Cost	S.E.	N	F	P	ETA^2
No musculoskeletal disorders	\$19.28	\$2.02	580	8.6	.004	.01
Musculoskeletal disorders	\$41.56	\$10.85	50			

TABLE 15-26

Mean Cost for Shoulder Bursitis Episodes, By Episode Duration

Duration	Mean Cost	S.E.	N	F	P	ETA^2
One day	\$8.36	\$0.32	373	32.8	<.0001	.27
2-7 days	15.15	1.24	43			
8-14 days	20.45	2.20	46			
15-30 days	19.34	1.63	54			
31-45 days	33.74	7.68	25			
46-60 days	40.31	7.51	30			
61-90 days	57.59	9.91	28			
91 or more days	127.70	34.55	30			

TABLE 15-27

Mean Cost of Shoulder Bursitis Episodes, By the Specialty of the Provider at the Index Contact

	Mean Cost	S.E.	N	F	P	ETA^2
Surgeon or emergency care surgeon	\$34.09	\$6.13	95	7.2	.0076	.01
All others	\$18.73	\$2.16	535			

TABLE 15-28

Mean Cost of Multiple-Contact Shoulder Bursitis Episodes, by the Presence or Absence of Selected Provider Specialty Contacts in the Episode

	Mean Cost	S.E.	N	F	P	ETA^2
No orthopedist	\$32.36	\$6.14	179	4.6	.03	.02
Orthopedist	\$54.39	\$6.75	81			
No surgeon	\$33.58	\$5.27	207	5.6	.02	.02
Surgeon	\$61.24	\$10.66	53			
No physical therapist contacts	\$20.14	\$1.00	211	94.0	<.0001	.27
Physical Therapist contacts	\$121.42	\$21.38	49			
No consultant	\$33.31	\$5.13	222	9.3	.0025	.03
Consultant	\$73.75	\$11.36	38			
All 260 episodes with 2 or more contacts	\$39.22	\$4.76	260	--	--	--

TABLE 15-29

Mean Cost Per Shoulder Bursitis Episode, By the Presence or Absence of Index Contact Instructions to Return for Further Care

	Mean Cost	S.E.	N	F	P	ETA^2
No return to consultant	$20.23	$2.08	606	3.9	.05	.01
Return to consultant	$41.48	$13.02	24			
No return to radiology	$17.74	$2.33	509	11.0	.001	.02
Return to radiology	$34.95	$4.15	121			
No return to physical therapy	$18.20	$1.29	611	67.6	<.0001	.10
Return to physical therapy	$112.55	$53.61	19			
No return ordered	$14.08	$1.40	406	21.3	<.0001	.03
Any return ordered*	$33.67	$5.12	224			

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*Return to non-consultant physician, consultant physician, laboratory, radiology, physical therapy, or any other instruction to return for further care.

TABLE 15-30

Mean Cost Per Shoulder Bursitis Episode, By the Type of Index Contact

	Mean Cost	S.E.	N	F	P	ETA^2
Regularly scheduled medical office visit	$17.55	$1.90	267	2.3	.07	.01
Walk-in or emergency room	$26.03	$3.82	311			
Telephone or letter	$9.27	$1.44	51			
Injection room	$2.50	--	1			

TABLE 15-31

Mean Cost Per Shoulder Bursitis Episode, By the Combinations of Office Procedures Used in the Episode

	Mean Cost	S.E.	N	F	P	ETA^2
None	\$8.83	\$0.41	352	99.2	<.0001	.32
Parenteral therapy only	\$18.01	\$0.98	216			
Physical therapy only	\$58.02	\$10.00	28			
Parenteral and physical therapy	\$136.24	\$29.91	34			

TABLE 15-32

Cost Per Shoulder Bursitis Episode, By the Types of Drug Orders

	Mean Cost	S.E.	N	F	P	ETA^2
No drugs ordered	\$6.82	\$1.26	54	12.8	.0004	.05
Any drugs ordered	\$23.34	\$2.57	170			
No narcotic analgesics	\$17.54	\$2.14	189	4.4	.04	.02
Narcotic analgesics	\$29.19	\$5.71	35			
No steroids	\$14.43	\$2.35	141	10.5	.0014	.05
Steroids	\$27.73	\$3.57	83			
No local anesthetics	\$16.23	\$2.28	160	6.0	.01	.03
Local anesthetics	\$27.16	\$4.07	64			
No non-steroid anti-inflammatory drugs	\$15.08	\$2.12	133	6.7	.01	.03
Non-steroid anti-inflammatory drugs	\$25.61	\$3.82	91			
All 224 episodes beginning in 1972-1973	\$19.36	\$2.00	224	--	--	--

TABLE 15-33

Mean Cost Per Shoulder Bursitis Episode, By Combinations of Drugs Ordered in the Episode

	Mean Cost	S.E.	N	F	P	ETA^2
No drugs	\$6.82	\$1.26	54	3.7	.0017	.09
Analgesics only (narcotics and non-narcotics)	\$10.81	\$3.11	11			
Anti-inflammatory only (steroids, others)	\$19.09	\$4.79	57			
Analgesics and anti-inflammatory drugs	\$25.48	\$6.75	24			
Local anesthetics and anti-inflammatory drugs	\$23.28	\$4.25	50			
Analgesics, local anesthetics, and anti-inflammatory drugs	\$41.07	\$10.25	14			
Other drugs only*	\$29.38	\$10.21	14			

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*Denotes episodes which received only tranquilizers or miscellaneous drugs.

TABLE 15-34

Extent of Relationships Between Mean Costs Per Shoulder Bursitis Episode and Selected Utilization Measures

Procedure	F	P	ETA^2
Initial and follow-up office visits for shoulder bursitis as the presenting morbidity	17.4	<.0001	.24
Number of drugs ordered	6.4	<.0001	.21
Parenteral therapy	21.9	<.0001	.17
Physical therapy	416.7	<.0001	.95
Radiology procedures	11.7	<.0001	.07
Laboratory procedures	2.7	.01	.02
Telephone calls	10.2	<.0001	.10
Hospitalizations	4.0	.05	.01

TABLE 15-35

Variables Included in Utilization AID Analysis for Episodes of Shoulder Bursitis

1. Type of index contact (regularly scheduled medical office, walk-in medical office, hospital emergency room, telephone or letter, injection room)
2. Number of initial and follow-up office visits at which shoulder bursitis was the presenting morbidity (0, 1, 2, 3, 4, 5+)
3. Number of telephone calls (0, 1, 2, 3+)
4. Number of physical therapy procedures (0, 1, 2-7, 8-17, 18+)
5. Number of laboratory procedures (0, 1+)
6. Number of shoulder x-rays (0, 1+)
7. Number of parenteral therapy procedures (0, 1, 2, 3+)
8. Combinations of office procedures (none, physical therapy only, parenteral therapy only, physical therapy and parenteral therapy)
9. Did all episodes consist of telephone calls? (yes/no)
10. Were any costs charged to the episode? (yes/no)

TABLE 15-36

Variables Included in Patient, Provider, and Medical Care Process AID Analysis of Shoulder Bursitis Episodes

1. Sex (male, female)
2. Status of index contact provider (regular attending, temporary attending, consultant and others)
3. Was this a new or continuing episode of bursitis? (yes/no)
4. Was this the patient's first episode of bursitis? (yes/no)
5. Were shoulder bursitis symptoms - pain, swelling, or limitation of motion of the shoulder - recorded? (yes/no)
6. Were psychiatric comorbidities recorded? (yes/no)
7. Did this episode have any comorbidities other than shoulder bursitis or its symptoms? (yes/no)
8. Were any orthopedist contacts present? (yes/no)
9. Were any surgeon contacts present? (yes/no)
10. Were any emergency surgery contacts present? (yes/no)
11. Were any contacts with urologists, physiatrists, administrators, or other miscellaneous specialties present? (yes/no)
12. Were there any contacts outside of regular medical office hours? (yes/no)
13. Was the index contact provider a surgeon or an emergency care surgeon? (yes/no)
14. Was bursitis the reason for the index contact? (yes/no)
15. Was non-bursitis musculoskeletal disease present as a comorbidity? (yes/no)

TABLE 15-37

Utilization of Medical Office Contacts in Shoulder Bursitis Episodes Receiving Five Different Bundles of Care*

Bundle	Proportion of Episodes in Each Bundle Receiving the Given Number of Office Contacts 0	1	2	3	4 or more
1. 18 or more physical therapy procedures	0	0	0	0	100.0
2. 8-17 physical therapy procedures	0	0	0	0	100.0
3. 2 or more office visits, 0-7 physical therapy procedures	0.8	8.3	52.6	21.1	17.3
4. 1 office visit	7.6	84.1	6.1	0.6	1.3
5. 0 office visits	19.9	69.5	9.3	0.0	1.3

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*Office visits, as used in bundle definition, refer to initial or follow-up medical office or emergency room contacts at which shoulder bursitis was the primary reason for the visit. Medical office contacts included contacts at which shoulder bursitis was not the presenting morbidity, but do not include emergency room contacts, whether bursitis was a primary or secondary reason for the visit.

TABLE 15-38

Combinations of Office Procedures Used in Shoulder Bursitis Episodes Receiving Five Different Bundles of Care

	Proportion of Episodes With Each Bundle of Care Receiving the Given Procedures				
Bundle	None	Parenteral Therapy Only	Physical Therapy Only	Parenteral and Physical Therapy	Total
1. 18 or more physical therapy procedures	0	0	29.4	70.6	100.0
2. 8-17 physical therapy procedures	0	0	26.7	73.3	100.0
3. 0-7 physical therapy procedures, with 2+ office visits	30.1	59.4	4.5	6.0	100.0
4. 1 office visit	58.3	37.8	2.9	1.0	100.0
5. 0 office visits	85.4	11.9	2.6	0.0	100.0

TABLE 15-39

Service Utilization Characteristics of Shoulder Bursitis Episodes Receiving Five Different Bundles of Care

	Bundle N		Mean Cost		All Medical Office Contacts		All Radiology Procedures		All Drug Orders		Parenteral Therapy		All Physical Therapy	
Bundle	All	1972-1973	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.
1. 18 or more physical therapy procedures	17	5	$229	$52	17.5	2.3	0.8	0.3	3.2	1.2	1.6	0.4	35.8	9.4
2. 8-17 physical therapy procedures	15	11	96	7	9.1	0.8	0.9	0.2	3.5	0.8	1.1	0.3	12.1	0.7
3. 0-7 physical therapy procedures, 2+ office visits	133	38	28	1.40	2.9	0.2	0.5	0.06	3.8	0.5	1.1	0.1	0.3	0.1
4. 1 office visit	314	109	13	0.30	1.1	0.04	0.2	0.03	1.7	0.1	0.4	0.02	0.1	0.03
5. 0 office visits	151	61	2	0.40	1.0	0.07	0.1	0.03	0.7	0.1	0.1	0.03	0.1	0.05
F			176.9		346.2		17.8		23.1		42.6		143.2	
P			<.0001		<.0001		<.0001		<.0001		<.0001		<.0001	

TABLE 15-40

Utilization of Selected Services Among Shoulder Bursitis Episodes Receiving Five Different Bundles of Care

Proportion of Episodes in Each Bundle Receiving the Service

Bundle	N	1+ Laboratory Tests	1+ Shoulder X-rays	1+ Rib, Upper Arm, Upper Spine X-rays	1+ Drug Orders*	1+ Physical Therapy	1+ Parenteral Therapy	Index Contact was Walk-In or Hospital Emergency Room	Index Contact was a Physical Examination	At Index Contact, Patient Instructed to Return for Further Care
1. 18+ physical therapy procedures	17	17.6	52.9	0	100.0	100.0	70.6	47.0	17.6	70.6
2. 8-17 physical therapy procedures	15	20.0	53.3	13.3	90.9	100.0	73.3	60.0	20.0	66.7
3. 0-7 physical therapy procedures; 2 or more office visits	133	6.0	41.4	5.3	89.5	10.5	65.4	62.4	0.8	47.4
4. 1 office visit	314	3.8	18.2	1.6	83.5	3.8	38.9	58.9	4.8	32.2
5. 0 office visit	151	2.6	11.3	1.3	49.2	2.6	11.9	17.2	37.1	25.2

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*Based on 224 episodes beginning in 1972-1973. Bundle1 - N = 5; Bundle 2 - N = 11; Bundle 3 - N = 38; Bundle 4 - N = 109; Bundle 5 - N = 61.

TABLE 15-41

Drug Orders Given in Shoulder Bursitis Episodes Receiving Five Different Bundles of Care

	Proportion of Episodes Receiving One or More of the Given Type of Drug Order:				
Bundle	Narcotic or Non-Narcotic Analgesic	Steroids, Other Anti-Inflammatory Drugs	Tranquilizers	Local Anesthetics	N
1. 18 or more physical therapy procedures	0	80.0	20.0	40.0	S
2. 8-17 physical therapy procedures	45.5	72.7	18.2	45.5	11
3. 0-7 physical therapy procedures; 2 or more office visits	36.8	86.8	21.1	39.5	38
4. 1 office visit	22.0	72.5	8.3	33.9	109
5. 0 office visits	9.8	34.4	4.9	8.2	61

TABLE 15-42

Patient Characteristics of Shoulder Bursitis Episodes Receiving Five Different Bundles of Care

Bundle	Patient Age (Years)		Mean Duration in Days	
	Mean	S.E.	Mean	S.E.
1. 18 or more physical therapy procedures	59	2.5	95	15
2. 8-17 physical therapy procedures	52	3.6	72	12
3. 0-7 physical therapy procedures, 2+ office visits	52	1.1	41	4
4. 1 office visit	48	0.8	6	1
5. 0 office visits	52	1.2	3	0.5

The mean patient age at the index contact for episodes receiving bundles 2 through 5 was 50 years; the significance of the difference between the mean age of episodes receiving the costliest bundle of care and all others was .01.

TABLE 15-43

Selected Patient Characteristics in Shoulder Bursitis Episodes Receiving Five Different Bundles of Care

	Proportion of Episodes in Each Bundle with the Given Characteristic:									
Bundle	Bursitis Presenting Morbidity at Index Contact	Symptoms Noted at Index Contact	Diagnosis Established at Index Contact	Shoulder Bursitis Recurred Following this Episode	Trauma Comorbidity Present in Episode	Bursitis of Other Sites Present in Episode	Non-Bursitis Musculoskeletal Disease Present	Obesity Present	No Comorbidities	Patient Had Previous Bursitis Episode
1. 18 or more physical therapy procedures	64.7	41.2	76.5	35.3	41.2	11.8	23.5	5.9	23.5	41.2
2. 8-17 physical therapy procedures	80.0	40.0	100.0	33.3	40.0	0.0	26.7	0.0	46.7	26.7
3. 0-7 physical therapy procedures; 2 or more office visits	94.0	51.1	83.5	37.6	34.6	3.3	9.0	4.5	54.1	28.6
4. 1 office visit	96.2	54.8	90.4	31.2	22.0	1.6	3.8	1.9	74.2	29.3
5. 0 office visit	19.9	28.5	88.1	25.8	37.1	8.6	11.9	13.9	23.8	37.7

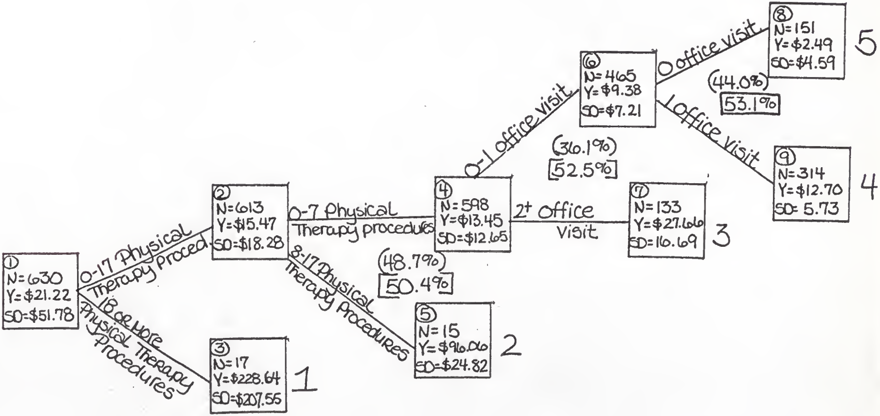
TABLE 15-44

Selected Provider Characteristics in Episodes of Shoulder Bursitis Receiving Five Different Bundles of Care

	Proportion of Episodes in Each Bundle with the Given Type of Drug Order:					
Bundle	Initial Provider Internist	Initial Provider Orthopedist	Initial Provider Surgeon or Emergency Surgeon	Any Orthopedist Contact	Any Surgeon or Emergency Surgeon Contact	Any Consultant Contact
1. 18 or more physical therapy procedures	47.1	11.8	41.1	64.7	52.9	47.1
2. 8-17 physical therapy procedures	66.7	6.7	20.0	46.7	26.7	26.7
3. 0-7 physical therapy procedures; 2 or more office visits	67.4	8.3	18.2	33.8	29.3	16.5
4. 1 office visit	64.0	13.7	15.9	15.3	16.9	1.3
5. 0 office visits	79.5	7.3	7.3	8.6	9.3	2.6

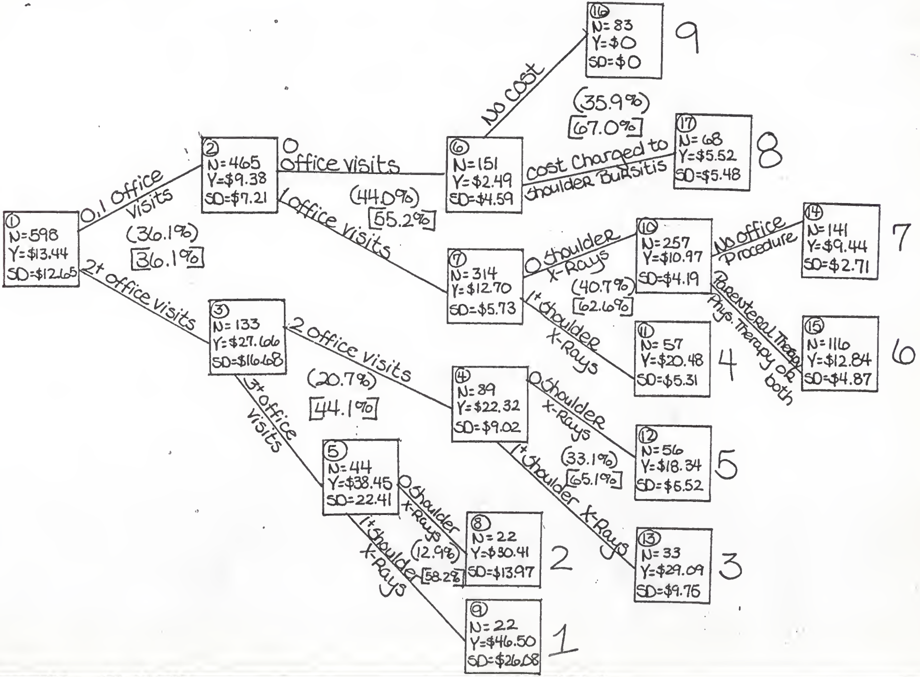
FIGURE 5-1

A.I.D. analysis for 630 episodes of shoulder bursitis, individual utilization measures are used to predict total episode cost. Boxes contain the number of episodes (N), mean dollars per episode (Y), and standard deviation (S.D.) for episodes in each group. Parentheses contain the percent of cost variation in each given group explained by the given split. Brackets contain the cumulative proportion of variation in cost explained by all prior splits. Large numbers indicate terminations of bundle pathways, in order of decreasing dollar costs. Overall mean costs in these figures are different from mean costs reported elsewhere in the analysis, due to cost rounding for A.I.D. analysis.



TABL[illegible]5-2

A.I.D. utilization analysis of 598 episodes of shoulder bursitis with seven or fewer physical therapy procedures. Utilization measures were used to predict total episode cost. For explanation of symbols, see Figure 15-1.



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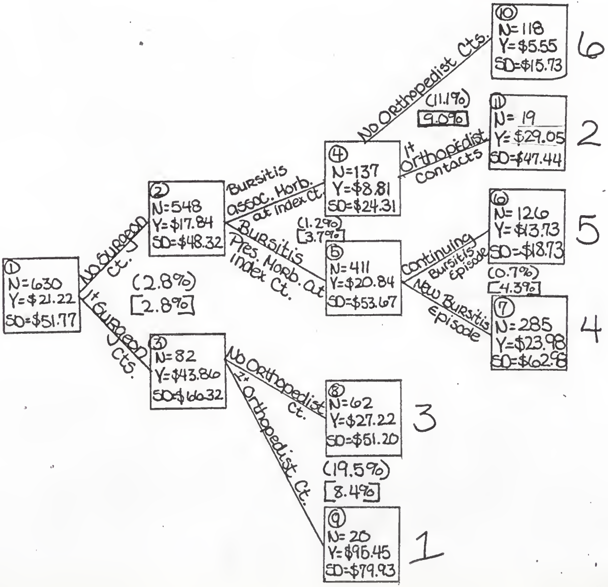
FI E 15-3

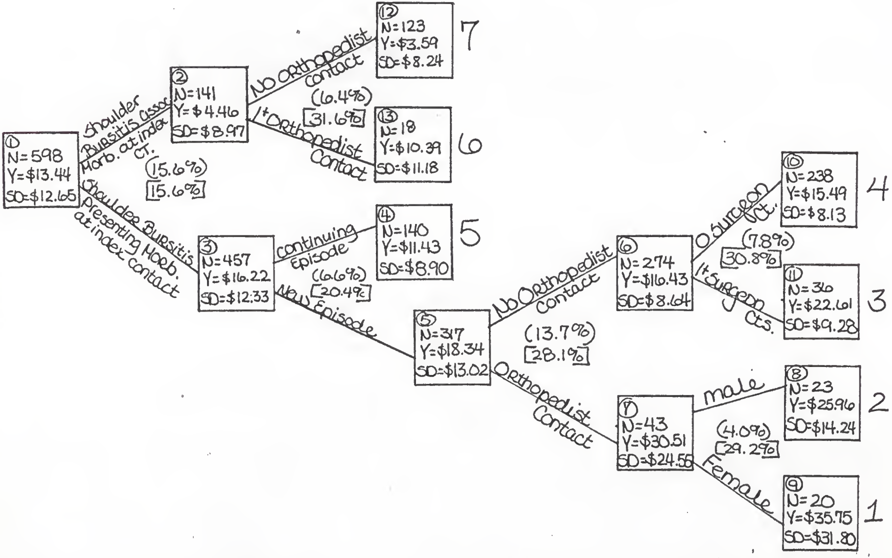
A.I.D. analysis of 630 episodes of shoulder bursitis, using patient, provider, and medical care process characteristics to explain variation in episode cost. For explanation of symbols, see Figure 15-1.



① N=630 Y=$21.22 SD=$51.77
No Surgeon Ct.
1+ Surgeon Cts.
(2.8%) [2.8%]
② N=548 Y=$17.84 SD=$48.32
③ N=82 Y=$43.86 SD$66.32
Bursitis assoc. Morb. at Index Ct.
Bursitis Pres. Morb. at Index Ct.
(1.2%) [3.7%]
④ N=137 Y=$8.81 SD=$24.31
⑤ N=411 Y=$20.84 SD=$53.67
No Orthopedist Cts.
1+ orthopedist contacts
(11.1%) [9.0%]
⑩ N=118 Y=$5.55 SD=$15.73
6
⑪ N=19 Y=$29.05 SD=$47.44
2
Continuing Bursitis Episode
New Bursitis Episode
(0.7%) [4.3%]
⑥ N=126 Y=$13.73 SD=$18.73
5
⑦ N=285 Y=$23.98 SD=$62.98
4
No Orthopedist Ct.
2+ orthopedist Ct.
(19.5%) [8.4%]
⑧ N=62 Y=$27.22 SD=$51.20
3
⑨ N=20 Y=$95.45 SD=$79.93
1

FIGU 15-4

A.I.D. analysis of 598 episodes of shoulder bursitis with seven or fewer physical therapy procedures, using patient, provider, and medical care process variables to explain cost per episode. For explanation of symbols, see Figure 15-1.



SECTION XVI.

SUMMARY AND CONCLUSIONS

This study attempted to examine hospital admissions, office visits, laboratory and radiology procedures, and drug orders as inputs into the process of caring for illness. Because such measures have been used as outputs, it has been difficult to understand the process of medical care using traditional analytic approaches. Viewing such measures as inputs to a total episode of care is a potential resolution of this problem. However, few data sets offer the opportunity to study medical care in an episode context. This project uses the data systems of the Health Services Research Center, Kaiser Foundation Hospitals and the population base upon which they are built to study total episodes of care.

From the beginning, the effort has been viewed as the first phase of a two-phase approach to understanding the cost implications of alternative diagnostic and treatment bundles for given medical conditions. This phase has involved the development of a methodology for identifying and examining alternative resource bundles and their costs in the care of many different conditions. Thirty-five conditions were considered, each of which place heavy resource demands on the health care system. Due to sample size limitations, lack of variation in care, lack of availability of important data, or lack of resources for proper analysis, 11 conditions were analyzed. For each of these 11 conditions alternative bundles of care or the variance inputs used to diagnose and manage episodes of the disease were identified, and the costs of the alternative input bundles were defined. To the extent possible, the sources of input or bundle cost variations were described in two ways. First, the major subcomponents of resource use were identified, including the relative costs of office visits, procedures, laboratory studies, and x-rays. Second, the impact of characteristics of the patient, the provider, and the medical context of the contacts on the total costs of episodes were analyzed.

All medical care contacts involving each of the 11 selected morbidities were included in the analyses as long as a notation was made in the medical record. Contacts were grouped into episodes in the manner defined in each disease report. Chronic conditions were defined as lifelong; therefore, all contacts for care of such conditions were, by definition, a part of the same episode. Episode criteria were defined by the collective judgment of the clinicians on the project team.

Given the episode definitions chosen, all outpatient medical care rendered for a given morbidity was included in the episode,d with the following exception. The morbidity of interest did not include a charge for an office visit if it was not the primary cause of the visit, even though some time may have been spent on that morbidity.

It was, therefore, possible to identify all of the care received by an individual with a given condition from the time of the first contact with the medical care system to the time of the last contact.

Defining Alternative Diagnostic and Treatment Bundles

The following diagnostic and treatment information was available: all services and procedures used in the defined episode, clinicians' first impressions, confirmed diagnoses and coexisting morbid conditions by ICDA number, by first impressions and confirmed diagnoses, and by RVS and/or cost values for each procedure and service.

Defining Characteristics of Patient, Provider, and Health Care Organization

The following information was available: patient identification, age, sex, Health Plan benefit package, periods of Health Plan membership, identity of provider of care, specialty of provider, symptoms at first contact in an episode (when recorded by the provider), and the locations, time, and setting of medical care contacts.

Defining Bundles

The principal technique used to define the bundles of care was the Automatic Interaction Detection (AID) analysis. This statistical technique is free from linear assumptions and provides the optimal means for dichotomizing predictor variables. As different bundles are identified, the numbers of observations in each bundle declines, reducing the possibility for making further divisions in the bundle.

Small sample sizes are associated with fewer and simpler bundles since the lack of numbers limits the opportunity to subdivide groups involving progressively fewer observations.

Sonquist and Morgan, who developed the AID technique, recommend its use for samples somewhat larger than most of the conditions analyzed. Thus, relatively simple bundles observed for such episodes do not necessarily indicate that there are no other bundles of care which might help explain variation in episode costs.

Reliability of Diagnoses

Diagnoses were obtained from the medical record and reflected the best judgment of the clinician. Two data fields qualified the diagnosis. The first indicated the "status" of the diagnosis, either tentative, established, or "unknown" (not clear from the record). The second indicated what the "updated" (confirmed) diagnosis was. That is, if an individual presented with a headache which was later determined to result from a glioblastoma, the presenting diagnosis for the first contact was headache, but the updated or confirmed diagnosis for each contact in the episode including the first was glioblastoma. Diagnoses were all based on provider judgment and not on formal criteria for each disease. Most analyses were limited to episodes where the diagnosis became both established and confirmed at some point in the episode.

Summary of Findings for Individual Conditions Analyzed

Table 16-1 shows the major predictors of utilization per condition, the range of costs per episode in the bundles of care, and the percent of variation in costs or resource use that is explained by the components of utilization. Table 16-2 presents the major patient, provider, and medical care system predictors of high resource use. Results are presented in RVS units for reports completed early and in actual 1970 dollars for reports completed after the development of the conversion system. One RVS unit is worth approximately four 1970 dollars. While this conversion is adequate, it does result in a slight overestimation of the costs of laboratory and radiology procedures. The number of different bundles of care identified per condition ranged from three (fever of unknown origin) to 10 (cystitis). For most conditions, the bundles of care (components of utilization) explain 55 to 70 percent of the variation in costs or RVS charges among episodes. As expected, the services and procedures that contributed to explaining the variation in episode costs were different for each condition.

These components of utilization were able to account for only 31 percent of the variation in resource use for episodes of obesity. This condition was vaguely defined, arbitrarily noted, and sporadically treated, so that grouping the major components of treatment per episode into bundles of care did not add substantial inforamtion to understanding the treatment of episodes of this disease. In other words, distinct bundles of care for episodes of obesity were difficult to identify. The bundles identified were primarily a matter of the increased use of all services and procedures rather than substantively different approaches to care. The range in costs was 10-fold. The variation in treatment cost per episode was related to age of the patient, to the number of comorbidities, and to the number of physical examinations in the episode. Since the data suggest a rather casual approach to diagnosing obesity as a medical care problem, cost differentials of treatment bundles are difficult to interpret.

The range of costs or RVS units per episode for most conditions was substantial. For acute cystitis this range was 22-fold, and the use of urine cultures and sensitivities was the major contributor to this range. The alternatives bundles of care did appear to be quantitatively different, as one-third of cystitis episodes received no culture, and four-fifths did not have a follow-up visit. Since chronic and recurrent cystitis were excluded from the analysis, the more costly episodes cannot be ascribed to these conditions. In fact, they seem to conform more closely to what has been regarded for many years as "standard" treatment. The data indicate, however, that practicing physicians have been following a lower cost alternative for years. Between-physician variation, in fact, explained 20 percent of resource use for this condition. Also, new health practitioners and pediatricians used substantially more resources in episodes of cystitis than other specialties; obstetricians used significantly fewer resources.

Because hypertension is a chronic condition which requires ongoing care, it is not surprising that episodes of hypertension had a wide range of costs (15-fold), and the number of office visits was the principal determinant of cost variation per episode. The increased interest in treating hypertension which followed the publication of the Veterans Administration Cooperative Study in the late 1960s appears to be reflected in the higher episode costs in the last two years of the follow-up period. Interestingly, episodes among young and old hypertensives appear to be more costly than do those among middle-aged hypertensives. Although relatively few hypertensive episodes involved intravenous urography, this procedure is sufficiently expensive that it was a significant contributor to total episode cost. Until recently this procedure was considered a part of the routine work-up performed on persons with diagnosed hypertension. Clearly, it was not used as routinely as the textbooks of the time would have suggested and, if it had been, the impact on episode cost would have been substantial. Patterns of care in the diagnosis and management of hypertension appear to be qualitatively different.

The costs of hemorrhoid episodes were largely determined by the occurrence of rubber band ligations and/or surgery. The bundles of care that were identified appear to reflect quantitatively different patterns of care. These differences were likely a product of symptom severity, although the relative contributions of symptoms and the specialty of the treating physician to the occurrence of surgical procedures were not clear. The lowest cost bundles for hemorrhoids suggest that the diagnosis was a casual observation which received little or no attention; the highest cost bundles suggest recurrent and marked discomfort. The issue of the clinical efficacy of surgical versus medical management of hemorrhoids is an interesting question reguiring attention.

Episodes of otitis media differed from the other conditions in three ways. First, episodes were followed for 21 days. No utilization after that period was examined, even where it existed. This approach was an attempt to observe only the variation in the initial response to the appearance of simple, acute otitis media. No implications about long-term costs can be drawn from the report. Second, because a large number of otitis media episodes had no resource use assigned to them (presumably they were mild cases that accompanied upper respiratory conditions to which the office visit was charged), episodes with resource use were examined as a group excluding those which had no resource use. Third, because of the large number of episodes and the frequency of drug orders for this condition, cost assignments were made for the ordering of drugs. Otitis media is the only condition for which drug costs were derived and analyzed. The two major determinants of resource use were the number of medical care contacts and the number of drug orders. The best predictor of the level of resource use per episode was the identity of the treating pediatrician. Thus, as for cystitis, the results suggest that inter-physician differences account for significant cost variation in treating otitis media. This analysis did not examine differences in long-term levels of resource use per episode by the initial treatment approach, and by the frequency of complication per bundle of initial care.

Differences in approach to care seem to be largely quantitative rather than qualitative for this frequent, relatively homogenous group of episodes although a three-fold difference in episode costs was observed. The potential for observing substitutable bundles may be large. It must, however, be borne in mind that low cost care is not necessarily medically optimal.

Fever of unknown origin (FUO) and breast lump episodes represented attempts to analyze variations in costs and practices involved in making difficult diagnostic decisions. These two conditions are not morbid entities but rather "diagnostic episodes," in that they include only the period from first contact to the making of a diagnosis (for breast lump) or cases in which no clinical diagnosis was ever made (for FUO). Although FUO is a standard diagnostic category, from the medical standpoint it represents a symptom whose cause was never identified. Thus, an FUO diagnosis indicates that fever was present but no cause is known. As might be expected, the costs of care for FUO episodes were related principally to the number of laboratory procedures rather than to qualitatively different approaches to treatment. The costs of these "episodes" were higher in the presence of return visit orders, lack of reported symptoms at first visit, the last three years of the study, and in persons over age five. There was, however, no assurance of the equivalency of clinical conditions in episodes receiving different levels of care. Degree and duration of fever both prior and subsequent to first contact would provide important information in identifying the determinants of cost for episodes of this condition.

Similarly, breast lump episodes were terminated when a diagnosis was established. The use of medical resources to reach this point is clearly related to the nature of the breast lump itself. Is the lump fixed? Is it well demarcated? Is it tender? Does it vary in size during the menstrual cycle? Such information was not included in the data, yet is an important determinant of resource use. Costs were higher in episodes with biopsies and multiple contacts, and in which a surgeon participated. Although these bundles represent qualitative differences in care, the episodes in which they were used may also have had the more suspicious lesions, though that cannot be demonstrated. The presence of a surgeon at the index contact was also associated with higher cost episodes. This may be a real effect of specialty difference, since this selection occurs prior to physical examination. The nine-fold variation in cost among bundles requires subdivision by clinical appearance. Breast lump episodes could be better examined if the diagnostic periods for breast lumps with a given outcome diagnosis were examined separately. That is, if all breast lumps which were eventually diagnosed as breast cancers, for example, were compared to each other with respect to the prediagnosis resource use. This approach would require substantially larger numbers of episodes than available for analysis.

For depression episodes, few services other than medical office contacts and drug orders were used. Nevertheless, this condition had a great range in costs (24-fold). Costs increased directly with the number of mental health provider contacts. The number of drug orders and of non-psychiatrist physician contacts per bundle were not directly related to bundle costs. It appeared that patients with many mental health contacts were likely to receive fewer drugs than those with many non-psychiatrist physician contacts. This indicated the possibility of substitution between drug therapy and psychotherapy, the two most common modalities for treatment of depression. However, like obesity, the recording of depression may be a casual observation by a clinician rather than a confirmed diagnosis. Because "true" depression and "casual" observations in the medical record, the findings are interpreted with caution. The degree to which referral to mental health clinic represents severity of depression or choice of provider independent of severity is not ascertainable from these data.

Variation in costs of shoulder bursitis episodes was largely related to the number of physical therapy procedures, parenteral therapies, and office visits. Alternative bundles of care appeared to represent qualitative differences in treatment. The number of surgeon and orthopedic contacts accounted for 9 percent of the variation in episode costs. When the bursitis is serious enough to be the primary reason for the initial contact, the costs per episode are higher. The range in costs of episodes was almost a hundred-fold. The episode approach identified the major factors which are predictors of variation from the cost standpoint, but the approach does not determine the degree to which the use of physical therapy and office contacts is a product of disease severity, provider choice, or patient factors.

The four-fold range in the costs of episodes of gonorrhea is determined in part by the number of physician contacts, the number of laboratory studies, and the number of nurse contacts (a proxy for antibiotic injections). Among episodes with multiple office visits, costs were higher for those involving persons over age 30. Since the significant complications of gonorrhea were not contributors to utilization in these episodes, the variation appears to represent variation in acute care costs.

The diagnosis and treatment of uncomplicated gonorrhea is relatively straightforward and standard. Males usually appear with symptoms and may be diagnosed immediately with a gram stain of urethral exudate. Females usually lack symptoms and, even if they have symptoms, require culture to determine whether or not infection is present. Degree of symptomatology for the acute condition is not likely to strongly influence the cost of diagnosis and treatment. Clinical choices which influence cost depend on the decision to treat at the first visit, to take a culture, and to order a return visit and repeat culture after care has been rendered. The data suggest that these are largely provider choices and that, as for cystitis episodes, the choices differ substantially among providers with the resulting question of their acceptability.

This condition is diagnosed and treated in a manner largely unrelated to patient characteristics (other than sex) and the options are well-defined quantitative ones.

These analyses addressed four different kinds of outpatient disease episodes:

1. Acute, usually self-limited conditions of relatively short duration (acute cystitis, acute otitis media, shoulder bursitis, and gonorrhea). Episodes of these conditions are not usually confounded by truncation effects at the beginning and end of the observation periods, and the clinical choices made by patients and providers are generally definable and identifiable. The episode approach is appropriate to such conditions. The effects of comorbid conditions can be dealt with by comparing groups with and without such conditions.

2. Chronic conditions (hypertension, hemorrhoids, and headache) by definition may last for years, making it impossible to observe entire (lifelong) episode costs. Truncation occurs and diagnostic costs are often concentrated in a brief period surrounding the presentation. Clinical choices are broad and depend on subtle differences in severity and in the presence or absence of comorbid conditions. In long episodes, comorbid conditions are usually present simply because other diseases will inevitably occur over time. The episode approach is applicable to these conditions under certain conditions. Some indication of severity of the condition is essential. Some clear clinical alternatives must be available which are related to the disease in question. Given

these prerequisites, the episode approach to such diseases is probably most suitable to selecting issues deserving of clinical trials. For example, does the frequency of office visits for equivalent levels of hypertension bear a relationship to blood pressure control? Does medical management of equally severe hemorrhoids have an equivalent outcome to surgical management?

3. Conditions whose diagnosis may represent serious disease or be a casual observation (obesity, depression). These are common and important medical problems which require some means for differentiating the casual from the serious notation in the medical record. Clearly, no action is a low-cost clinical choice which any provider may elect. The degree to which inaction reflects the fact that a problem is minor versus the failure of a provider to deal with a serious problem is essential for understanding the contributing factors to costs of caring for these conditions. This is, of course, true of all conditions, but especially so for these. Obesity receives little attention in the medical care process. Depression may receive a great deal of attention. Both conditions would be prime candidates for outcome studies of the efficacy of various approaches to care.

4. Diagnostic episodes (FUO, breast lump). These conditions largely represent episodes of diagnosis rather than of treatment. The examination of alternative diagnostic practices is an important component to understanding the costs of medical care. This approach, however, requires large numbers

of episodes, and episodes which have eventual diagnoses that are similar should be dealt with separately. This would tend to make clinical presentations relatively uniform.

Limitations and Cautions

While it was possible to construct episodes, such episodes were not necessarily episodes of illness but rather episodes of care. Obtaining episodes of disease of comparable severity was also a problem given the amount of information available. The use of criteria such as the elimination of episodes without resource use or the elimination of episodes involving recurrence of acute conditions introduced some degree of homogeneity of episodes but did not appear to be sufficient to account for the variations in the severity or possible stage of the disease.

Conditions were followed only during an individual's period of Health Plan Membership. Persons who had a given diagnosis prior to joining the Health Plan did not have truly "new" episodes even though they were recorded as such. Persons whose episodes extended beyond the follow-up period (true by definition for all chronic disease unless death has occurred) were not examined as a total episode, but rather for a defined period of time. Persons who had a given condition within the Health Plan prior to the observation period were identified, however, this information was taken into account in the analyses. Attempts were made to adjust for these problems by examining chronic conditions separately during the first six months after diagnosis.

The method permitted the identification of alternative bundles of care for each of the conditions by either relative values or desired dollar costs. The relative values or costs per episode did not include any inpatient services for hospitalizations that occurred during the course of the episode. In addition, information about drug orders was available for only two years and no relative values or costs were assigned to drugs except for otitis media episodes. Drug use (as opposed to drug orders) was not analyzed.

The use of care outside of the traditional medical care system (e.g., chiropractors, naturopaths, nonprescription drugs, etc.) was not available. Thus, the analyses represent an assessment of outpatient cost to the medical care system rather than total cost.

The derivation of episode costs by the method does not recognize that the intention of the prescriber of two alternative approaches to medical care might differ, and short-term cost differentials may not, in fact, reflect either long-term cost differences or medical outcome differences. For example, a physician who refers a patient to a nutritionist after a myocardial infarction will use more resources, all other things being equal, than one does who does not. There is no opportunity in this data system to determine that the long-term differences in cost might outweigh the short-term implications.

For a variety of reasons, it was not possible to identify the least costly but medically acceptable bundle of care for each condition. One basic reason is that the various bundles of care that were identified may have differentiated episodes by the severity of the disease rather than by alternative patterns of care. Thus, variation in episode costs may have been due to severity.

The findings also showed that for conditions such as acute cystitis and gonorrhea, where a standard protocol for diagnosis and treatment exists, the least costly bundles of care did not generally follow the standard protocol. While medical outcomes of the episodes were not specifically ascertained, there was no indication in the information that outcomes differed on the basis of the bundle of care received. Also, among the conditions for which no standard protocols exist, such as hemorrhoids and headache, the physician panel could not agree upon the medical acceptability of the various bundles of care identified.

The patient, provider, and medical care process characteristics did not appear to be substantial predictors of episode costs among any of the conditions. While this finding is reasonable, it must be recognized that a limited number of patient factors were included. Also, any effect from a number of provider and medical care process characteristics could not be separated from a utilization bias. For example, the presence of a specialty in an episode, or the presence of a regularly scheduled appointment, requires that a contact for care had to be made. While specialty of provider was frequently a signficiant influence upon episode costs, any differences in the clinical status of the persons presenting were not ascertained. Also, among the conditions with large numbers of episodes, it did appear that inter-physician differences in providing care contributed to the variation in episode costs. In this instance also, differences in clinical presentations among physicians were not ascertained.

The models derived from the log-linear multivariate contingency analyses to indicate the relationship between bundles of care and the patient, provider, and medical care process characteristics were not useful in identifying any significant interactions among these characteristics. The models generated were largely self-evident from the preceding analysis and from common sense as well. The significant contribution of these analyses was the lack of any unsuspected relationships.

The results of the various analyses of the conditions were not sufficient to use them to estimate the technical rates of substitution for more costly bundles of care with less costly bundles of care without any change in the medical acceptability of the care for each of the conditions. While it appeared that such estimates could be made directly by comparing the bundles of care for each condition, it was recognized that the various bundles of care may not contain episodes of comparable patients or case mixes. Definitive answers were not possible from these data although some interesting observations were made. It did appear that laboratory procedures and drug orders may be substituted for office visits in some conditions. It also appeared that physician extenders generated more costly bundles of care than physicians in a number of the conditions.

Policy Implications and Future Research

The current study was designed to develop an approach to episode analysis of conditions which consume substantial medical care resources. The results are not intended to be used to determine medical care policy. The approaches developed and the information generated might be used by peer review committees and insurers in setting standards, but the results leave too many unknowns to permit policy decisions. Further, there are conceptual problems associated with this approach to making policy decisions. These problems are particularly true for chronic conditions often associated with significant comorbid conditions. Hypertension and diabetes, for example, are frequently associated with cardiovascular sequelae. Meaningful decisions about the cost-effectiveness of care using different approaches must somehow deal with the impact the given approach might have on long-term sequelae. Clinical trials may be the only means for addressing such questions.

Health policy must be built on a philosophical foundation of social and economic priorities. The relative cost of alternative approaches to care is a small component of the information required to set such policies. The information can be used in defining areas where clinical trials might be conducted to determine if two or more approaches to a condition with significantly different costs have, in fact, different clinical outcomes.

The episode approach to analyzing medical care costs is a unique, but labor intensive means for understanding the financial implications of medical care practices. As such it has the potential for assisting in decision making with respect to therapeutic approaches. The key to making policy decisions from episode based analyses of morbidity-specific medical care utilization is the definition of substitutable bundles of care. The findings for several conditions raise numerous questions about alternative patterns of care and their substitutability. The answers are not possible without more intensive investigations of the conditions and patterns of treatment for them.

Future Phase II research efforts using an episode methodology with the intent of applying the results to policy determination should fulfill the following requirements:

1. The number of episodes must be adequate to identify discrete bundles of care and to further permit the subclassification and/or adjustment of episodes by important potentially confounding variables, such as age, sex, severity of disease, and presence of relevant comorbid conditions. Clearly, sample sizes must be larger where there are more bundles of care and where more confounding variables are present. At least 1,000 episodes should be available unless little subgrouping is necessary.

2. A method for assessing severity or staging of the condition is necessary. This might involve the simple elimination of complications (realizing that this approach lacks an ability to determine which bundles of care are more likely to lead to complications), or subgrouping by some assessable

level of severity, such as blood pressure, or classification by symptoms at index contact. The latter, of course, requires that symptoms be reliably recorded.

3. The validity and reliability of the diagnoses must be established in a similar manner. Conditions such as hypertension may be well documented in the medical record. Conditions such as depression, which are often more a matter of subjective observation than of clinical criteria, are more difficult to analyze.

4. The intended outcome of therapy should be taken into account where appropriate. That is, a medical care option may initially be more expensive but, in the long run, less expensive. Referral to a nutritionist for dietary counseling after a myocardial infarction is an example where this may be true.

5. There should be medically acceptable alternative approaches to caring for the condition whether or not such approaches have been evaluated.

6. Long-term observation is required for chronic diseases.

7. There should be a means for ascertaining episodes which appear for the first time from those which have previously been treated for the same condition. This is especially true for chronic diseases.

8. There must be a means of summarizing total costs of care rendered. If one bundle involves many laboratory services and another includes many office visits, these bundles must be reducible to a common summary measure for purposes of comparison.

Lastly, Table 16-3 indicates the suitability or lack thereof of each of the specific conditions for a more detailed Phase II analysis. Acute cystitis, hypertension, otitis media, and gonorrhea are the most likely to fulfill the above requirements, although any of the conditions could be suitable if sufficient information were available from the medical record.

LE 16-1
Number of Bundles of Care Range in Episode Costs Per Bundle, Percent of Variation in Espisode Cost Explained by Few Bundles, and Major Explanatory Variables for Each Condition Studied

Condition	No. of Different Bundles of Care	Range of Cost ($ or RVS)	% of Var. Cost Exp.	Components of Utilization Listed in Order of Importance
Obesity (< 1 year)	7	1.2-11.2 RVS	31	No. office visits, lab studies, telephone contacts, MD contacts
Acute cystitis	10	1.0-22.4 RVS	62	No. urine cultures, antibiotic sensitivity tests, office visits, x-rays
Hypertension	9	$5.50-80.50 per year	70	No. office visits/yr, I.V. urography, No. electrolyte tests
Hemorrhoids	7	$3.01-154.60 ?	66	Rubber band ligations, office visits, surgery, barium enemas
Otitis media (RVS>0)	8	2.0-5.7 RVS	67	No. contacts, drug orders, parenteral drug orders
FUO	3	2.1-5.7 RVS	56	No. lab studies
Headache	8	$1.26-57.69	59	X-rays & EEG use, No. office visits, telephone calls, lab tests

TABLE [illegible]-1 - Continued

Condition	No. of Different Bundles of Care	Range of Cost ($ or RVS)	% of Var. Cost Exp.	Components of Utilization Listed in Order of Importance
Depression	5	$13.63-323.20	57	No. mental health visits, MD contacts,
Breast lump	4	$ 6.54-125.54	67	Biopsy procedure, No. contacts, presence of a surgeon
Shoulder bursitis	5	$ 2.49-228.64	53	No. physical therapy, parenteral therapy, office visits
Gonorrhea	6	$11.70-46.70	59	No. MD contacts, lab studies, RN contacts

TABLE 16-2

Patient, Provider Characteristics Predictors of Episode Costs

Condition	% of Explained Variation	Major Predictors of Costs Listed in Order of Importance
Obesity (RVS Units >0)	6	Age, years, physical exam contacts, No. comorbidities
Acute cystitis	15	Specialty of provider, presence of comorbid conditions, cystitis diagnosed at first contact
Hypertension	37	Year, age, % physical exam contacts, presence of walk in contacts
Hemorrhoids	35	Hemorrhoids as a presenting morbidity, regularly scheduled contacts, surgeon contacts, return ordered at index contact, physical exams per episode
Otitis media (RVS Units >0)	14	Physician I.D., year, presence of non-respiratory comorbidities
FUO	29	Episode duration, return visit, symptoms, years, age

Condition	% of Explained Variation	Major Predictors of Utilization Listed in Order of Importance
Headaches	18	No. non-physician contacts, presence/absence of comorbidities, specialty of provider, symptoms at index contact, status of provider
Depression (RVS units >0)	34	Presence of psychiatrist contact, presence of psychologist contact, presence of social worker contact, depression as the presenting morbidity
Breast lump	19	Surgeon at index contact, updated morbidity
Shoulder bursitis	9	No. surgeon contacts, bursitis as presenting morbidity, No. orthopedic contacts
Gonorrhea	31	Presence regulary scheduled appointments, presence walk-in appointments, age, presence associated morbidities

TABLE 16-3
Suitability of Conditions for Phase II Analysis

Condition	Suitable for Phase II Analysis	Other Comments
Obesity	No. Use as control variable for other disease entities	Need to distinguish casual from meaningful diagnoses. Not highly resource consuming five directly, but with possible effects on other diseases
Acute cystitis	Yes	Need to focus on factors which may lead to chronic cystitis
Hypertension	Yes, can control for presence of other morbidities. Efficacy of therapy is known. Chart review to determine B.P. level needed	Separate effects of diagnosis and therapeutic priorities on outcome as reflected by change in B.P.
Hemorrhoids	Possibly, but a means is needed for determining the degree to which surgical intervention is related to symptom level vs. seeing a surgeon	A clinical trial is a better approach
Otitis media	Yes, opportunity for observing inter-physician variation	Focus on factors that lead to chronic recurrent otitis

TABLE 16-3 - Continued

Condition	Suitable for Phase II Analysis	Other Comments
FUO	No. Need a means for quantifying symptoms (level and duration of fever). Diagnostic criteria in practice are too vague	Phase II would require prospective design, more cases and specific diagnostic criteria
Headache	Probably. Cases should be separated by diagnostic outcome or lack thereof	Brief episodes should be treated separately from recurrent headaches. Drug data interesting.
Depression	Possible. Expensive and common, but problems of diagnostic criteria and illness severity remain to be solved.	Phase II would require prospective design, specific diagnostic and severity criteria, and more cases. A clinical trial of outcomes and costs of drug therapy versus psychotherapy, and of physician versus mental health specialist care may be useful.
Breast lump	No. Unless substantially larger number of cases available	Need cases with some eventual diagnosis examined separately and some measure of inter-physician variation
Shoulder bursitis	Doubtful. Like depression, separating cases into uniform diagnostic groups is difficult	Need more cases, requires prospective design
Gonorrhea	Yes.	More cases would improve analysis. Inter-physician variation important

GLOSSARY OF TERMS

1. CRVS - California Relative Value Scale. See RVS.
2. Dollar cost - The cost in 1971 U.S. dollars for rendering medical care. Some of the disease chapters use dollar cost as an outcome variable. Those which use RVS units were completed prior to the development of a mechanism for converting RVS units to 1971 dollar costs.
3. Eligibility (Health Plan eligibility) - Membership in the Kaiser-Permanente Medical Care Program. This is an issue because persons who are not health plan members may be more likely to seek a a part of their care outside the system. Generally, though, discontinuous eligibility periods were infrequent enough that they did not significantly influence resource utilization.
4. Episode of care - Period of time between first contact with the medical care system for a given morbid condition and the last contact for the same conditions within a given episode as defined in individual disease chapters. The episodes discussed herein are episodes of care, rather than episodes of disease since we have no way of determining how long a condition existed prior to seeking care or after the last contact.

5. Five percent sample - A random five percent of KPMCP subscriber units (6,000 - 10,000 persons depending on year) used for these studies. This sample had all contacts with the medical care system including telephone calls, letters, office visits, etc. reduced to computerized form between September 1966 and January 1974.

6. Presenting morbidity - The primary morbid condition leading to a contact with the medical care system. If the diagnosis is uncertain or in error the initial presenting morbidity will later be updated to the Updated Presenting Morbidity.

7. Resource use - Medical care rendered which is definable in terms of RVS units and/or dollar cost according to the coding systems of the Health Services Research Center.

8. RVS - Relative Value Scale. A 1980 modification of the 1964 California Relative Value Scale developed by Jane Record, Lee Penn and Arnold Hurtado. This system permits addition of costs of care across time and across specialty lines.

9. Symptom codes - A special set of codes developed by the research medical records division of the Health Services Research Center for coding symptoms from the medical record. Symptoms are only coded at the initial contact for a given morbid condition.

10. Updated presenting morbidity - The final diagnosis of a given morbid condition. A field with the updated presenting morbidity is included for every contact for any given episode of a condition. If a diagnosis is changed, this field is also changed for every contact in the episode, even those which precede the final diagnosis. See Presenting Morbidity.

11. NHP - New Health Practitioner

12. Associated morbidity - Any morbidity which is not the primary reason for a contact with the medical care system.

13. Comorbidity - Morbidities co-existing with the condition under study.

14. Continuing episode - an episode of care which began prior to the initiation of the data collection system in September, 1966.

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